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THE AGARICACEAE OF THE PACIFIC COAST—II

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The present article deals with two series of gill-fungi, those with hyaline spores and those with ochraceous or ferruginous spores.

SERIES I. SPORES HYALINE

Species belonging to the genera ordinarily known as *Lepiota, Amanitopsis,* and *Amanita* are considered in this series. Some of these names, unfortunately, can no longer be used, but in the most important one, *Amanita,* the new name suggests the deadly nature of many of the species and should prevent any serious mistakes.

Annulus alone present.	1. LEPIOTA.
Volva alone present.	2. VAGINATA.
Volva and annulus both present.	3. VENENARIUS.

1. LEPIOTA (P. Browne) S. F. Gray, Nat. Arr. Brit. Pl. 1: 601. 1821

1. **Lepiota subnivosa** sp. nov.

Pileus thin, convex to plane, umbonate, solitary, 1.5–3 cm. broad; surface dry, smooth, somewhat striate at times, slightly innate-fibrillose, with a few scattered floccose scales, snow-white throughout or rose-tinted on the umbo; lamellae free, narrow, not crowded, white; spores ellipsoid, smooth, hyaline, uniguttulate, 7–8 × 3.5 μ; stipe thicker below, slender, glabrous, hollow, white, 5–9 cm. long and 2–4 mm. thick; annulus superior, white,

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fixed, rarely ample and persistent, usually breaking up and vanishing, especially in small plants.

Type collected on the ground in deep woods near Seattle, Washington, October 20–November 1, 1911, *W. A. Murrill 336.* Also collected on banks in woods as follows: Seattle, Washington, *Murrill 304, 346, 485, 514, Zeller 105.* Related to *L. cristatella* Peck.

2. LEPIOTA CRETACEA (Bull.) Morgan, Jour. Myc. **13**: 3. 1907

Lepiota cepaestipes Quél. Champ. Jura Vosg. 35. 1872.

Seattle, Washington, *Murrill 537.*

3. **Lepiota petasiformis** sp. nov.

Pileus thin, hat-shaped, with prominent conic umbo, scattered or gregarious, 1.5–2.5 cm. broad; surface dry, rosy-isabelline, or about the color of the back of the hand, covered with an abundance of fine powder; lamellae free, subdistant, rather broad, white; spores ellipsoid, smooth, hyaline, minute, $3.5 \times 2\,\mu$; stipe slender, tapering upward, clothed with powder like the pileus, reaching 6 cm. long and 2–3 mm. thick; veil fugacious, not forming an annulus.

Type collected in humus in woods near Seattle, Washington, October 20–November 1, 1911, *W. A. Murrill 629.* Also collected in the same region, *Zeller 119.* It suggests some forms of *L. cretacea.*

4. LEPIOTA CRISTATA (Bolt.) Quél. Champ. Jura Vosg. 34. 1872

Seattle, Washington, *Murrill 356, 633, 695*; Stanford University, California, *McMurphy 30, 141;* Berkeley, California, *Harper;* Santa Cruz, California, *G. J. Streator.*

5. **Lepiota castaneidisca** sp. nov.

Pileus fleshy, regular, convex, umbonate, gregarious, 1.5–4 cm. broad; surface dry, white, with small, imbricate, avellaneous to light-chestnut scales, the umbo chestnut with unbroken cuticle; lamellae free, white, broad, ventricose, rather close; spores ellipsoid, smooth, hyaline, $5–6 \times 3\,\mu$; stipe cylindric, equal, hollow, glabrous, brownish-tinted, 4–7.5 cm. long, 3–10 mm. thick; annulus white, superior, delicate, inconspicuous.

Type collected on the ground under redwoods near Searsville Lake, California, December 11, 1911, *James McMurphy 123*. Related to *L. cristata*.

6. **Lepiota amplifolia** sp. nov.

Pileus convex to subexpanded, umbonate, gregarious, reaching 3.5 cm. broad; surface smooth, white, polished, with a few delicate, floccose, isabelline-testaceous scales, the umbo isabelline-testaceous with cuticle subentire; lamellae free, white, not crowded, very broad and triangular; spores oblong-ellipsoid, smooth, hyaline, 8–9 × 3.5 μ; stipe equal, finely fibrillose, hollow, white, becoming rose-tinted on drying, 7–9 cm. long, 2–4 mm. thick; veil white, evanescent, remaining only in small fragments clinging to the margin and stipe.

Type collected on the ground in a dense fir forest at Glen Brook, Oregon, November 7, 1911, *W. A. Murrill 738*. In a dried condition, this species somewhat resembles *L. mutata* Peck, described from Kansas in 1896.

7. **Lepiota Sequoiarum** sp. nov.

Pileus thin, convex to nearly plane, umbonate, gregarious, 2–4 cm. broad; surface dry, finely imbricate-fibrillose-scaly, white, the center more densely fibrillose and tinted with isabelline, the remainder of the surface being at times tinted with the same color in the scales; context loosely woven, thin, white; lamellae white, free, close, narrow; spores ovoid to ellipsoid, smooth, hyaline, 7–9 × 3.5–4 μ; stipe tapering upward, long, slender, white, smooth, glabrous, hollow, reaching 10 cm. long and 5 mm. thick; annulus superior, white, not fixed but collapsed on the stipe, persistent.

Type collected on the ground in Muir Woods, California, November 22, 1911, *W. A. Murrill 1143*.

8. **Lepiota fumosifolia** sp. nov.

Pileus convex, not umbonate, gregarious, 3 cm. broad; surface dry, white with isabelline, granular scales, the center isabelline; lamellae free, broad, rather crowded, white, becoming fumosous on drying; spores oblong-fusiform, smooth, hyaline, 12 × 7 μ; stipe equal or tapering upward, cylindric, smooth, white, furfuraceous, pale-avellaneous below, 6 cm. long, 6 mm. thick;

veil soon breaking into fragments which cling to the margin and stipe.

Type collected on the ground in woods near Seattle, Washington, October 20–November 1, 1911, *W. A. Murrill 229.*

9. **Lepiota castanescens** sp. nov.

Pileus small, thin, convex to subexpanded, prominently umbonate, 2–3 cm. broad; surface dry, densely appressed-fibrillose, white to rose-colored, glabrous and darker-red on the umbo, the entire surface changing to castaneous on drying; lamellae free, crowded, narrow, plane, white, becoming fumosous on drying; spores ellipsoid, smooth, pointed, strictly hyaline, $7–8 \times 3–4\ \mu$; stipe tapering upward, slender, slightly fibrillose, hollow, about 6 cm. long and 2–5 mm. thick, white or rose-tinted, changing to castaneous on drying; annulus superior, fixed, ample, persistent, white, changing to castaneous on drying.

Type collected on the ground in woods near Seattle, Washington, October 20–November 1, 1911, *W. A. Murrill 397.*

10. **Lepiota roseilivida** sp. nov.

Pileus convex to expanded, thin, umbonate, gregarious, 2.5–4 cm. broad; surface dry, minutely and densely fibrillose-scaly, rose-lilac, livid in the center, becoming slightly darker on drying; lamellae white, unchanging, free, crowded, narrow; spores ellipsoid, smooth, hyaline, $8–9 \times 4–5\ \mu$; stipe slender, tapering upward, subglabrous, white or pallid, changing to lilac on drying, hollow, 7–10 cm. long, 2–5 mm. thick; annulus superior, movable, ample, membranous, lilac-tinted, becoming lilac on drying.

The type of this beautiful species was collected on the ground in Muir Woods, California, November 22, 1911, *W. A. Murrill 1138.*

11. **Lepiota subfelina** sp. nov.

Pileus thin, convex to expanded, distinctly umbonate, solitary, about 2 cm. broad; surface dry, white, densely covered with small, latericious, imbricate scales, the umbo bay, with strigose-tomentose covering; lamellae free, rather broad, plane, close, white; spores oblong-ellipsoid, smooth, hyaline, $8 \times 4\ \mu$; stipe very slender, slightly tapering upward, white and finely fibrillose above, avellaneous with a rosy tint below, and decorated with latericious fragments resembling the scales on the pileus, 4 cm. long, 2–2.5 mm. thick; veil obsolete, not forming an annulus.

Type collected on the ground in woods near Seattle, Washington, October 20–November 1, 1911, *W. A. Murrill 349*. Also collected at the same time in the same region, *W. A. Murrill 622*. In the latter collection, one pileus has the cuticle ruptured concentrically and the scales drawn together into rather coarse gemmate warts or ridges.

12. **Lepiota concentrica** sp. nov.

Pileus rather thick, convex to subexpanded, scarcely umbonate, solitary, 3–4 cm. broad; surface dry, white with yellowish tints between concentric rows of coarse, strigose-floccose, latericious, raised scales formed from the deeply ruptured cuticle, the unruptured central portion being fuliginous; margin uneven, eroded, bearing fragments of the fugacious white veil; lamellae white, free, rather broad and close; spores ovoid, smooth, hyaline, $6 \times 3.5\,\mu$; stipe tapering upward, decorated with fibrils from the veil, hollow, white above, cremeous and more shaggy below, 7–9 cm. long, 5–15 mm. thick.

Type collected on the ground in woods near Seattle, Washington, October 20–November 1, 1911, *W. A. Murrill 587*. Also collected in the same region, *Zeller 103*. Related to *Lepiota fuscosquamea* Peck.

13. **Lepiota roseifolia** sp nov.

Pileus regular, convex to subexpanded, solitary, 4 cm. broad; surface dry, shining, innate-fibrillose, radiate-rimose, smooth and glabrous at the center, castaneous, blackish-tinted when fresh, assuming a more reddish tint after picking; lamellae free, crowded, slightly ventricose, regular, white when fresh, changing to rose-colored on drying or when bruised; spores ellipsoid, smooth, hyaline, $7–8 \times 3–3.5\,\mu$; stipe equal, compressed, very long because buried in leaves, hollow, smooth, glabrous, avellaneous-isabelline, white at the apex, 17 cm. long, 5 mm. thick; annulus superior, slight, fixed, fuliginous.

Type collected in humus in a redwood forest at La Honda, California, November 25, 1911, *W. A. Murrill & L. R. Abrams 1287*.

14. LEPIOTA BRUNNESCENS Peck, Bull. Torrey Club **31**: 177. 1904

Stanford University, California, *Baker 149;* Searsville Lake, California, *McMurphy 45.* Described from plants collected near St. Louis by Glatfelter. The western plants are not entirely typical, but they show the same decided change in color.

15. LEPIOTA NAUCINA (Fries) Quél. Champ. Jura Vosg. 35. 1872

Stanford University, California, *Dudley 73, 324, Baker 133* (in part); Pasadena, California, *McClatchie.*

16. **Lepiota fuliginescens** sp. nov.

Pileus convex to subexpanded, solitary, about 8 cm. broad; surface dry, finely imbricate-floccose-scaly, slightly rimose, white with rosy tints, becoming fuliginous on drying; lamellae free, distant, narrow, arcuate, white, changing to pale-latericeous on drying; spores regularly ovoid, smooth, hyaline, $6 \times 4\,\mu$; stipe long and twisted owing to its struggle through the leaves, tapering upward, polished, hollow, colored and changing like the pileus, about 10×1 cm.; annulus superior, ample, fixed, white to pale-fuliginous.

Type collected on the ground in a redwood forest at La Honda, California, November 25, 1911, *W. A. Murrill & L. R. Abrams 1265.*

17. **Lepiota rubrotinctoides** sp. nov.

Pileus convex to nearly plane, often umbonate, sometimes depressed in old plants, solitary or gregarious, 4–7 cm. broad; surface dry, subglabrous, white with rosy tints to red or purplish, the center always darker, varying from pink or red to dark-purple or blackish, cuticle even and unbroken when young, splitting radially, especially on the margin, as the pileus expands; context thin, white, drying soft and flexible; lamellae free, narrow, close, plane, white, the edges minutely serrulate; spores subovoid, smooth, hyaline, with a large clear nucleus, $7 \times 3.5\,\mu$; stipe long and slender, equal or slightly tapering upward, hollow, glabrous or somewhat fibrillose, white, $10–15 \times 0.5–1$ cm.; annulus superior, fixed, membranous, ample, white, persistent.

Type collected on the ground in woods near Seattle, Washington, October 20–November 1, 1911, *W. A. Murrill 286.* Very abundant in the forests on the Pacific coast, and very constant in form, although varying in the amount of red coloring matter in the cuticle. It differs from *L. rubrotincta* Peck in its larger size, darker umbo, smaller spores, and the absence of scales on the surface of the pileus. Other collections are as follows: Seattle, Washington, *Murrill 338, 422, 573, Zeller 90;* Glen Brook, Oregon, *Murrill 768;* Muir Woods, California, *Murrill 1142;* La Honda, California, *Murrill & Abrams 1304;* Searsville Lake, California, *McMurphy 95, 96.*

18. **Lepiota magnispora** sp. nov.

Pileus thin, conic to convex, with a more or less prominent umbo, finally nearly plane, 3–5 cm. broad; surface dry, shaggy, imbricate-floccose-scaly, the umbo fulvous with erect scales, the rest of the surface pale-isabelline with numerous, darker isabelline or fulvous, upturned scales thinning out toward the margin, which is decorated with projecting scales and fragments of the veil; lamellae free, not crowded, of medium width, white; spores oblong-fusiform, smooth, hyaline, 15–18 × 4–5 μ; stipe slightly tapering upward, with a small bulb at the base, glabrous at the apex, very floccose-tomentose and isabelline below, about 9 cm. long and 6 mm. thick; veil cottony, ample, ochraceous-isabelline, not forming an annulus but adhering to the margin and stipe.

Type collected on the ground among dead leaves in deep woods near Seattle, Washington, October 20–November 1, 1911, *W. A. Murrill 704.* Also collected as follows: Seattle, Washington, *Murrill 512, 518, 601, Zeller 114;* Stanford University, California, *Miss Patterson 23.*

19. LEPIOTA AMIANTHINA (Scop.) Quél. Ench. Fung. 7. 1886

This is a variable and widely distributed temperate species which has received many names, among them *Lepiota granulosa, L. carcharias, L. rugoso-reticulata, L. adnatifolia,* and *L. granosa.* Forms with coarse granules and rather brilliant colors are commonly referred to *L. granulosa,* while those with fine

granules and paler coloring are called *L. amianthina* or *L. granulosa amianthina*. There is little doubt that Scopoli in 1772 knew both these forms. Another character in which this species is both aberrant and variable is the attachment of the gills, which are sometimes squarely adnate or even a little decurrent and at other times they are adnexed or barely reach the stipe. All these variations in granular covering and gill attachment are represented on the Pacific coast, where the plant is common. When the species is more thoroughly known in its entire range, it may be possible to recognize two or three of these forms as species, and it may also be more consistent to group them under a distinct genus between *Lepiota* and *Armillaria*, as suggested by Fayod in 1889.

Seattle, Washington, *Murrill 320, 457, 472, 571, 588, 645, 678;* Tacoma Prairies, Washington, *Murrill 715;* Glen Brook, Oregon, *Murrill 743;* Corvallis, Oregon, *Murrill 910, 954, 957;* Newport, Oregon, *Murrill 1077;* Salem, Oregon, *M. E. Peck.*

20. LEPIOTA ASPERA (Pers.) Quél. Ench. Fung. 5. 1886

This rather rare but widely distributed temperate species was found only once. *L. asperula* Atk. and *L. eriophora* Peck, described from American material, should be compared with it carefully.

Seattle, Washington, *Murrill 436.*

21. **Lepiota nardosmioides** sp. nov.

Pileus thick, fleshy, convex, slow to expand, 6 cm. broad in its unexpanded form, resembling that of *Armillaria nardosmia* in form and color; surface dry, fibrillose, castaneous, becoming somewhat mottled with lighter and darker areas, margin strongly incurved; lamellae free, crowded, broad, ventricose, pallid; spores ovoid to ellipsoid, smooth, hyaline with an umbrinous tint, 5–7 × 3.5–4 μ; stipe short, 2.5 cm. thick, bulbous, white, glabrous above and cottony below the large, membranous, simple, white, persistent annulus, which is fixed above the center of the stipe and is decidedly cottony on its lower surface.

Type collected on humus in a redwood forest at La Honda, California, November 25, 1911, *W. A. Murrill & L. R. Abrams 1250.*

2. VAGINATA (Nees) S. F. Gray, Nat. Arr. Brit. Pl. **1**: 601. 1821

Amanitopsis Roze, Bull. Soc. Bot. Fr. **23**: 50. 1876.

1. VAGINATA VAGINATA (Bull.) Murrill, Mycologia **3**: 80. 1911

Found in its grisette form only and rather sparingly, but sometimes reaching 12 cm. in diameter, with a huge, subglobose, inflated volva resembling that of *A. volvata.*

Glen Brook, Oregon, *Murrill 749;* Mill City, Oregon, *Murrill 831;* Corvallis, Oregon, *Murrill 925;* Newport, Oregon, *Murrill 1080;* La Honda, California, *Murrill & Abrams 1268;* Santa Cruz, California, *G. J. Streator.*

2. **Vaginata velosa** (Peck)

Amanitopsis velosa Peck, Bull. Torrey Club **22**: 485. 1895.

This species, described from material sent from Pasadena by McClatchie, is near *V. vaginata,* but has large whitish volval patches on the buff-colored pileus. It is abundant in southern California, almost to the exclusion of the common eastern species.

Pasadena, California, *McClatchie;* Stanford University, California, *Nohara 56, Miss Patterson 62, Baker 154, 381;* Searsville Lake, California, *W. F. Wight 159.*

3. VENENARIUS Earle, Bull. N. Y. Bot. Gard. **5**: 450. 1909

The type of *Amanita* is *Agaricus campestris, Amanita* thus being a synonym of *Agaricus.* Earle erected the new genus *Venenarius for A. muscaria* and other species in which the basal volva breaks into fragments, leaving *Leucomyces* of Battarra for the remaining species. More recent usage discards Battarra's genus as not based on binomial publication, leaving the one genus *Venenarius,* which, in my opinion, is quite sufficient for all the species of *Amanita* as ordinarily considered.

1. VENENARIUS MUSCARIUS (Fries) Earle, Bull. N. Y. Bot. Gard. **5**: 450. 1909

Brilliant orange and red sporophores of this deadly species were found in abundance in the sandy pine barrens at Newport, Oregon, and fresh specimens were shown me by Professor Setchell at Berkeley, California.

Newport, Oregon, *Murrill 1032;* Monterey, California, *Dudley 323.*

2. **Venenarius solitarius** (Bull.)

Agaricus solitarius Bull. Herb. Fr. *pl. 48.* 1780.

Stanford University, California, *Dudley 145, McMurphy 6.*

3. **Venenarius phalloides** (Vaill.)

Agaricus phalloides Fries, Syst. Myc. **1**: 13. 1821.

No fresh plants of this deadly poisonous species were seen during my stay on the Coast, but Professor Campbell told me of a white species that occurs about Stanford University having the characters of *V. phalloides,* and the specimens cited below, which are without notes, may represent it. The spores of these specimens are subglobose to ovoid, smooth, hyaline, 8–10 × 6–7 μ.

Santa Cruz Mountains, California, *Dudley 99;* Santa Cruz, California, *G. J. Streator.*

4. **Venenarius ocreatus** (Peck)

Amanita ocreata Peck, Bull. Torrey Club **36**: 330. 1909.

Pileus fleshy, convex or nearly plane, glabrous, even on the margin, white, flesh white; lamellae close, unequal, broadly sinuate, white; stem equal, solid, glabrous or slightly fibrillose below the annulus, minutely floccose above, white, the annulus thin, membranaceous, the volva white, soft, deep with an entire free margin; spores subglobose or elliptic, 10–12 × 8–10 μ.

Pileus 4–6 cm. broad; stem 8–10 cm. long, 1–2 cm. thick.

Described from specimens collected by Baker under oaks at Claremont, California. Types not seen. Evidently closely related to the white forms of *V. phalloides.*

5. **Venenarius bivolvatus** (Peck)

Amanita bivolvata Peck, Bull. Torrey Club **36**: 329. 1909.

Pileus fleshy, convex or nearly plane, at first viscid, striate on the margin, white, brownish in the center, flesh white; lamellae close, unequal, free, white; stem equal, solid, flocculose, annulate, white, the annulus narrow, often disappearing with age, the volva large, thick, soft, spongy, lobed on the outer margin and having an elevated entire inner margin surrounding the stem; spores subglobose or broadly elliptic, 10–12 × 8–10 μ.

Pileus 7–10 cm. broad; stem 13–15 cm. long, 1.6–2.5 cm. thick.

Described from specimens collected by Baker under oaks at Claremont, California. Types not seen.

6. **Venenarius calyptratus** (Peck)

Amanita calyptrata Peck, Bull. Torrey Club **27**: 14. 1900.

Pileus fleshy, thick, convex or nearly plane, centrally covered by a large irregular persistent grayish-white fragment of the volva, glabrous elsewhere, striate on the margin, greenish-yellow or yellowish-brown tinged with green, the margin often a little paler or more yellow than the rest: lamellae close, nearly free but reaching the stem and forming slight decurrent lines or striations on it, yellowish-white tinged with green: stem stout, rather long, equal or slightly tapering upward, surrounded at the base by the remains of the ruptured volva, white or yellowish white with a faint greenish tint: spores broadly elliptic, 10 μ long, 6 μ broad, usually containing a single large nucleus.

Pileus 10–20 cm. broad: stem 10–15 cm. long, 12–20 mm. thick.

Described from specimens collected by Dr. H. Lane in fir forests in Oregon. The volva wall is one-fourth to one-half inch thick in the "egg" stage, and the pileus is apparently unable to break through it at times, thus dying and decaying in its infancy. Dr. Lane thoroughly tested the edibility of this species and found it good and wholesome.

7. **Venenarius calyptratoides** (Peck)

Amanita calyptratoides Peck, Bull. Torrey Club **36**: 329. June, 1909.

Amanita calyptroderma Atkinson & Ballen, Ann. Myc. **7**: 365. August, 1909.

Pileus fleshy, convex, then nearly plane, striate on the margin, covered in the center by a large irregular adhering fragment of the white universal veil or by small fragments formed by the breaking up of the veil, grayish-brown or lead-colored or sometimes ochraceous or cream-colored, flesh white, taste mild; lamellae moderately close, unequal, sinuate, adnexed, white; stem nearly equal, hollow, striate at the top, white, the slight evanescent annulus soon disappearing or becoming inconspicuous; spores often uninucleate, broadly elliptic, 10–12 × 6–8 μ, usually with an oblique apiculus at one end.

Pileus 4–8 cm. broad; stem 8–12 cm. long, 8–16 mm. thick.

Described from specimens collected by Baker at Claremont, California. Mrs. Ballen's specimens, judging from her description, agree substantially, only they are somewhat larger. *V. calyptrata* is distinguished chiefly by its greenish tints.

8. **Venenarius umbrinidiscus** sp. nov.

Pileus fleshy, drying very thin, convex to expanded, at length depressed, umbonate, solitary, reaching 10 cm. broad; surface moist, glabrous, with large, irregular, adherent patches of the white volva, melleous, fading to stramineous on the conspicuously long-striate margin, the umbo yellow in young plants, becoming umbrinous; lamellae free, broad, not crowded, white; spores large, subglobose, smooth, hyaline, 7–9 μ; stipe white or slightly yellowish, tapering upward, 12 cm. long, 1–2 cm. thick; annulus ample, white, persistent, fixed above the center of the stipe; volva rather short, white, tough, 3 cm. broad, with subentire free limb.

Type collected on the ground in a fir forest near Seattle, Washington, October 20–November 1, 1911, *W. A. Murrill 414.* Also collected in the same region, *S. M. Zeller 100.* The flesh and gills are freely eaten by slugs. Related to *Amanita virosa.*

9. **Venenarius pantherinoides** sp. nov.

Pileus thick, fleshy, globose to plane, solitary, reaching 10 cm. broad; surface melleous or dirty-cremeous with brown or chestnut center, sticky when wet, slightly striate in old plants, the white volval patches small, numerous, regular, and regularly distributed until many of them fall away with age; lamellae sinuate, crowded, plane, white; spores ovoid, smooth, hyaline, 9 × 5 μ; stipe tapering upward, white, glabrous, reaching 11 cm.

long and about 2 cm. thick, with bulbous base; annulus large, white, superior, persistent; volva white, 3 cm. broad, tough, regular, persistent, with entire or undulate free limb.

Type collected on a south slope in woods near Seattle, Washington, October 20–November 1, 1911, *W. A. Murrill 399.* Also collected as follows: Seattle, Washington, *S. M. Zeller 80, W. A. Murrill 328;* Newport, Oregon, in sandy pine barrens, *W. A. Murrill 1092.* Specimens at Albany sent by Copeland from California and temporarily referred by Peck to *Amanitopsis adnata* appear to belong here, but I have not examined them microscopically.

10. **Venenarius praegemmatus** sp. nov.

Pileus hemispheric to subexpanded, often splitting at the margin with age, scattered, reaching 6 cm. broad; surface smooth, melleous-avellaneous in the center, dark-melleous on the margin, not striate, densely covered with persistent, white, cottony, gemmate warts, the remains of the volva; lamellae free, crowded ventricose, white; spores ovoid to subglobose, smooth, hyaline, 8–10 μ; stipe tapering upward from a bulbous base, smooth, white, reaching 7 cm. long and 1.5 cm. thick; annulus ample, white, persistent, fixed just above the middle of the stipe; volva white, 3 cm. broad, 2 cm. high, closely attached to the bulb and scarcely showing a free limb, without friable remains in the soil.

Type collected on sandy soil in open woods near Seattle, Washington, October 20–November 1, 1911, *W. A. Murrill 247.* Also collected as follows: Seattle, Washington, *W. A. Murrill 548, 646;* Coos Bay, Oregon, *H. D. House 76.* Fresh specimens suggest one of the honey-colored forms of *V. muscaria,* and dried specimens are not very different from small plants of *A. rubescens.*

SERIES 2. SPORES OCHRACEOUS OR FERRUGINOUS

Several departures from ordinary generic usage are made here. In using the key, please bear in mind that *Cortinarius, Inocybe, Hebeloma,* and *Naucoria* are not considered, these genera being reserved for later publication.

Lamellae readily separable from the context.

Stipe lateral or none.	1. TAPINIA.
Stipe central or eccentric.	2. PAXILLUS.

Lamellae not readily separable from the context.
- Volva and annulus absent; veil evanescent, if present.
  - Pileus dimidiate or resupinate. — 3. CREPIDOTUS.
  - Pileus centrally stipitate.
    - Stipe cartilaginous.
      - Lamellae free. — 4. PLUTEOLUS.
      - Lamellae adnate or adnexed; margin of pileus straight from the first. — 5. CONOCYBE.
      - Lamellae decurrent. — 6. TUBARIA.
    - Stipe fleshy; lamellae adnate or decurrent; universal veil not arachnoid. — 7. GYMNOPILUS.
- Volva absent, annulus present.
  - Stipe glabrous or fibrillose. — 8. PHOLIOTA.
  - Stipe squarrose-scaly. — 9. HYPODENDRUM.
- Volva present, annulus absent. — 10. LOCELLINA.

1. TAPINIA (Fries) Karst. Hattsv. 452. 1879

TAPINIA PANUOIDES (Fries) Karst. Hattsv. 452. 1879

Seattle, Washington, *Murrill 313, 515, 530, Zeller 40;* Berkeley, California, *Harper.*

2. PAXILLUS Fries, Gen. Hymen. 8. 1836

1. PAXILLUS INVOLUTUS (Batsch) Fries, Gen. Hymen. 8. 1836

Corvallis, Oregon, *Murrill 1013;* Stanford University, California, *McMurphy 137.* Found in abundance under conifers on the campus of the Agricultural College, the pileus sometimes reaching over a foot in breadth.

2. PAXILLUS ATROTOMENTOSUS (Batsch) Fries, Epicr. Myc. 317. 1838

Coos Bay, Oregon, *H. D. House 86.*

3. CREPIDOTUS (Fries) Quél. Champ. Jura Vosg. 106. 1872

1. CREPIDOTUS HERBARUM Peck, Ann. Rep. N. Y. State Mus. **39**: 72. 1886

Agaricus (*Crepidotus*) *Herbarum* Peck, Ann. Rep. N. Y. State Mus. **26**: 56. 1874.

Seattle, Washington, *Murrill 660;* Tacoma, Washington, *Murrill 719;* Stanford University, California, *Dudley 156, 175, McMurphy 146.*

2. CREPIDOTUS MALACHIAS (Berk. & Curt.) Peck, Ann. Rep. N. Y. State Mus. **39**: 71. 1886

Seattle, Washington, *Murrill 314.*

3. CREPIDOTUS MOLLIS (Schaeff.) Quél. Champ. Jura Vosg. 106. 1872

Seattle, Washington, *Zeller 126;* La Honda, California, *Murrill & Abrams 1273;* California, *McClatchie.*

4. **Crepidotus submollis** sp. nov.

Pileus sessile, reniform to subcircular, lobed, wood-loving, 2–4 cm. broad; surface white to discolored, finely silky, radially sulcate or plicate, strigose-hirsute behind; lamellae white to ferruginous, rather broad, not distant, edges concolorous; spores ellipsoid, smooth, melleous under a microscope, 9×4–$5\,\mu$.

Collected on dead alder in woods near Seattle, Washington, October 20–November 1, 1911, *W. A. Murrill 572 (type), 603.* Also collected at Berkeley, California, February 7, 1911, *R. A. Harper 27.*

5. CREPIDOTUS PUBERULUS Peck, Bull. Torrey Club **25**: 324. 1898

Pileus thin, reniform or suborbicular, nearly plane, wood-loving, 6–10 mm. broad; surface minutely pubescent, brown; lamellae ventricose, rather broad, rusty-brown when mature, whitish on the edge; spores subellipsoid, usually uninucleate, 9–10×5–$6\,\mu$; stipe 2–4 mm. long, equal, curved, lateral or eccentric, brown, with a patch of white mycelium at the base.

Compton, California, *McClatchie.*

6. CREPIDOTUS CALOLEPIS (Fries) Quél. Ench. Fung. 108. 1886

Crepidotus fulvotomentosus Peck, Ann. Rep. N. Y. State Mus. **26**: 57. 1874.

Corvallis, Oregon, *Murrill 907.*

4. PLUTEOLUS (Fries) Gill. Champ. Fr. **1**: 549. 1878

1. PLUTEOLUS LUTEUS Peck, Bull. Torrey Club **22**: 203. 1895

Described from specimens collected by McClatchie under trees near Pasadena, California, in December. Specimens from Stanford University, California, *Baker 161*, distributed as *Bolbitius radians* Morg., are much larger than the types, reaching 7 cm. broad and 10 cm. high.

Pasadena, California, *McClatchie;* Stanford University, California, *Baker 161, 380, Miss Patterson 13, 67, Nohara 28;* California, *Harper 14.*

2. **Pluteolus stramineus** sp. nov.

Pileus thin, convex, solitary, 5 cm. broad; surface glabrous, viscid, flavous and rugose at the center, pale-stramineous and closely and conspicuously striate from the central area to the margin; lamellae narrow, free or slightly adnexed, twice inserted, dull dirty-stramineous; spores ovoid, smooth, bright ochraceous-melleous under a microscope, 11–14 × 6–8 μ; stipe perfectly straight, cylindric, equal, fleshy, smooth, stramineous, pulverulent above, hollow, 10 cm. long, 5 mm. thick.

Type collected in an open grassy yard after a light rain, Corvallis, Oregon, November 6–11, 1911, *W. A. Murrill 1019.* Related to *Pluteolus luteus.*

3. PLUTEOLUS CALIFORNICUS McClatchie, Proc. S. Cal. Acad. Sci. **1**: 383. 1897

Described from plants collected by McClatchie on dead stems and manure at Compton, California. The specimens sent to Dr. Peck appear to be quite distinct from *P. luteus.*

4. **Pluteolus parvulus** sp. nov.

Pileus convex to subplane, thin, solitary, scarcely 1 cm. broad; surface smooth, glabrous, shining, slightly viscid, dark-avellaneous, the small umbo concolorous, margin striate; lamellae free, ventricose, broad, fulvous, the edges white and minutely serrulate; spores ellipsoid, regular, smooth, bright-melleous under a microscope, 9–11 × 5 μ; stipe enlarged at the apex, pulverulent above, glabrous below, smooth, straw-colored, hollow, flaccid and collapsing, 2 cm. long, 1 mm. thick.

The type of this dainty little species was collected in humus on the ground in woods at Preston's Ravine, near Palo Alto, California, November 25, 1911, *W. A. Murrill & L. R. Abrams 1189.* Related to *P. callistus,* but smaller and lacking the red center.

5. CONOCYBE Fayod, Ann. Sci. Nat. VII. **9**: 357. 1899

Galera (Fries) Quél. Champ. Jura Vosg. 103. 1872. Not *Galera* Blume 1825.

1. CONOCYBE TENER (Schaeff.) Fayod, Ann. Sci. Nat. VII. **9**: 357. 1899

This species is rather common, the usual form being slender and small. No. 395, however, growing in a compost heap at the edge of a woodland, is large, with isabelline cap and fulvous stipe, resembling the form sometimes called *G. sphaerobasis* Post. Specimens of *C. tener* from California have been referred by some to *Galera versicolor* Peck, but this species, described in 1897 from South Dakota material collected by Williams, is not a *Galera* but a *Pluteolus,* near *P. luteus* and *P. expansus.*

Seattle, Washington, *Murrill 395, 609;* Corvallis, Oregon, *Murrill 1004;* Preston's Ravine, California, *Murrill & Abrams 1167, 1180;* Stanford University, California, *Dudley 77, Baker 127, 1868;* California, *Miss Sutliff.*

2. CONOCYBE HYPNORUM (Batsch) Murrill, Mycologia **4**: 75. 1912

Seattle, Washington, *Murrill 421, 446;* Preston's Ravine, California, *Murrill & Abrams 1217.* Stanford University, California, *L. R. Abrams 202a.*

3. **Conocybe Bryorum** (Pers.)

Galera Bryorum (Pers.) Sacc. Syll. Fung. **5**: 868. 1887.

Seattle, Washington, in peat bog, *Murrill 391;* Tacoma Prairies, Washington, *Murrill 716.*

4. **Conocybe Sphagnorum** (Pers.)

Galera Sphagnorum (Pers.) Sacc. Syll. Fung. **5**: 869. 1887.

Kadiak, Alaska, *Trelease 511;* Yakutat, Alaska, *Trelease 514a, 516.* This species has a much longer stipe than *C. Bryorum,* but the two are closely related. I have not seen the Alaskan specimens here listed.

5. **Conocybe semilanceata** (Peck)

Galera semilanceata Peck, Bull. Torrey Club **23**: 415. 1896.

Pileus membranous, acutely conic or campanulate, often sharply umbonate, glabrous, sulcate-striate, pale-yellow or buff; lamellae rather broad, ascending, distant, adnate, tawny-ferruginous when mature; stem slender, glabrous, hollow, pallid; spores ellipsoid, ferruginous, 10–12.5 × 5–6 μ; pileus 4 to 6 lines broad; stem 1.5 to 2 in. long, .5 to 1 line thick.

Described from specimens collected by Yeomans among fallen leaves, sticks, mosses, etc., at Camas, Washington. The types at Albany are somewhat broken and rather difficult to compare.

6. **Conocybe angusticeps** (Peck)

Galera angusticeps Peck, Bull. Torrey Club **24**: 143. 1897.

Pileus thin, narrowly and irregularly conic or subcylindric, obtuse, acute, or abruptly acuminate at the apex, even, glabrous, viscid and dark-ochraceous when young and moist, nearly white when old and dry, the margin somewhat incurved and appressed to the stem; lamellae close, narrow, adnate, somewhat white-margined, more or less anastomosing, brownish-ferruginous when mature; stem slender, glabrous, hollow, equal or slightly thickened at the base, whitish or tinged with yellow, shining when dry; spores ellipsoid, 10–12.5 × 7.5 μ. Pileus 8–15 lines long, 4–6 lines wide; stem 1.5–3 in. long, 1–1.5 lines thick.

Described from specimens collected by McClatchie on grassy ground in streets and pastures, at Pasadena, Los Angeles, and Compton, California. The pileus is viscid, estriate, and does not expand. *G. Besseyi,* described from Colorado, is apparently not distinct.

7. **Conocybe lirata** (Berk. & Curt.)

A. (*Galera*) *liratus* Berk. & Curt. Proc. Am. Acad. Arts & Sci. **4**: 116. 1858.

Galera lirata (Berk. & Curt.) Sacc. Syll. Fung. **5**: 865. 1887.

Described from specimens collected by Wright on the bark of oak trees on Mare Island, California. Pileus very small, umbilicate, reddish, atomaceous, margin striate; gills adnate, few, broad; stipe short. Types not seen.

6. TUBARIA (W. G. Sm.) Gill. Champ. Fr. **1**: 537. 1878

1. TUBARIA FURFURACEA (Pers.) Gill. Champ. Fr. **1**: 538. 1878

This species is common in California. *T. inquilina* is very closely related. *T. Eucalypti* Earle is a name assigned for purposes of distribution but no description was published. *Naucoria paludosa* Peck, described from the Catskills, is apparently identical, although the description calls for somewhat longer spores. *Tubaria contraria* Peck, also from New York, is apparently not distinct. All of the specimens listed below agree in having much closer lamellæ than European specimens obtained from Bresadola; in this particular they agree with *T. deformata* Peck.

Seattle, Washington, *Murrill;* Preston's Ravine, near Palo Alto, California, *Murrill & Abrams 1209, 1223;* Santa Cruz Mountains, California, *Dudley 130;* Stanford University, California, *Abrams 202, 203, Baker 157, 170, Dudley 76, 149, 167, 181, McMurphy 144, Nohara 4, 32, Miss Patterson 8, 42, 60.*

2. TUBARIA PALLESCENS Peck, Bull. Torrey Club **22**: 202 1895

Pileus fleshy but thin, convex or nearly plane, sometimes slightly depressed in the center, glabrous, hygrophanous, brick-red when moist, yellowish or cream color when dry; lamellae broad, adnate or slightly decurrent, tawny-buff, becoming brownish-ferruginous; stem slender, hollow, yellowish, with white mycelium at the base; spores ellipsoid, $7.5 \times 4\,\mu$. Pileus 5 to 10 lines broad; stem 12–18 lines long, .5 to 1 line thick.

Described from specimens collected by McClatchie among sticks and leaves near Pasadena, California. Types not seen.

3. TUBARIA TENUIS Peck, Bull. Torrey Club **23**: 415. 1896

Pileus membranous, hemispheric or convex, obtuse or subumbilicate, glabrous, hygrophanous, reddish-cinnamon when moist,

cream color or pale-ochraceous when dry, either faintly striate or sulcate-striate on the margin; lamellae 1–2 lines wide, distant, ventricose, adnate or slightly decurrent, tawny-ochraceous; stem slender, flexuous, often uneven, hollow, pruinose at the top, downy at the base, pale-yellow or cream color; spores ellipsoid, $7.5 \times 5\,\mu$. Pileus 4–8 lines broad; stem 1–2 in. long, about 1 line thick.

Described from specimens collected by McClatchie among mosses on gravelly hillsides near Pasadena, California. Types not seen.

4. TUBARIA BREVIPES Peck, Rep. Harriman Alaska Exped. Crypt. 45. 1904

Pileus thin, convex, glabrous, ferruginous; lamellae broad, arcuate, distant, adnate or slightly decurrent, ferruginous; stem short, slender, glabrous, hollow, brown; spores ellipsoid, uninucleate, 10–12 μ long, 7–8 μ broad. Pileus 6–10 mm. broad; stem 6–14 mm. long, scarcely 1 mm. thick.

Described from specimens collected on the ground at Port Clarence, Alaska, *Trelease 562, 567*. The dried specimens are said to resemble *Omphalia Campanella* in color, but the spores are ferruginous, $10–12 \times 7–8\,\mu$.

7. GYMNOPILUS Karst. Hattsv. 400. 1879

Flammula (Fries) Quél. 1872. Not *Flammula* DC. 1818.

Several divisions of this genus have been proposed but none of them are satisfactory in the presence of the actual specimens. The veil, the attachment of the gills, the habitat of the plant, the shade of color in the spores, and the viscidity of the pileus may all be helpful in the separation of species, but they do not seem to furnish reliable and convenient characters for the segregation of the genus.

Most of the species here treated are plainly congeneric and rather difficult to separate from the descriptions alone. *G. decoratus* and *G. viridans* are imbricate-scaly; *G. echinulisporus* has noticeably roughened or echinulate spores; *G. laeticolor* is bright-red in color; *G. subflavidus* and *G. viridans* become green-spotted when handled; and *G. carbonarius* has peculiarly dark-colored gills when the spores mature.

1. **Gymnopilus laeticolor** sp. nov.

Pileus convex or somewhat conic to subexpanded, rarely umbonate, thin, cespitose, wood-loving, 3–5 cm. broad; surface smooth, glabrous, slightly viscid, hygrophanous, miniatous when young, becoming testaceous at the center and ochroleucous on the margin in mature plants; context dull-colored, bitterish; lamellae adnate, rather narrow, not crowded, ochraceous; spores ellipsoid, smooth, hyaline with a yellowish tint under a microscope, probably pale-ochraceous in mass, with one or two very brilliant nuclei, 7×3–$4\,\mu$; stipe equal, miniatous to ochroleucous below, white above, slightly moist and viscid, decorated with a few fibrils, the remains of a slight white veil, about 7 cm. long, 4–8 mm. thick.

Collected from the under side of a much decayed coniferous log in the forest near Seattle, Washington, October 20–November 1, 1911, *W. A. Murrill 297, 505 (type)*. Related to *F. astragalina*.

2. **Gymnopilus decoratus** sp. nov.

Pileus convex to slightly depressed, at times umbonate, cespitose, wood-loving, 3.5–5 cm. broad; surface slightly viscid, the center imbricate-scaly with pale-bay scales, chestnut-colored on the umbo, the remainder of the surface cremeous, fading to white toward the margin; lamellae adnate or sinuate, isabelline to fulvous, rather broad but plane, not crowded, edges undulate; spores ellipsoid or ovoid, smooth, very pale melleous under a microscope, 5–6×3.5–$4\,\mu$; cystidia abundant, hyaline, conic, tapering to a short, narrow stalk, obtuse at the apex, $30 \times 12\,\mu$; stipe equal, rather tough, stuffed, white or yellowish, shaggy-fibrillose, 5–8 cm. long, 5–6 mm. thick; veil fibrillose, evanescent, remaining attached partly to the margin and partly to the stipe.

Collected abundantly on dead wood in open ground or in woods near Seattle, Washington, October 20–November 1, 1911, *W. A. Murrill 553 (type), 538, 619*. Also collected on dead wood in a dense fir forest at Glen Brook, Oregon, November 7, 1911, *W. A. Murrill 750*.

3. **Gymnopilus ornatulus** sp. nov.

Pileus convex to nearly plane, gibbous or umbonate, cespitose, 3 cm. broad; surface dry, slightly viscid when wet, fibrillose, flavo-melleous tinted with pale rose-brown, the latter color more conspicuous at the center; lamellae adnate, plane, broad, of medium distance, pallid when young, becoming pale-fulvous from the

spores; spores ellipsoid, smooth, pale-melleous under a microscope, 6×3.5–$4\,\mu$; stipe smooth, glabrous and cremeous at the apex, subconcolorous and shaggy-fibrillose below, 5 cm. long, 4 mm. thick.

Type collected on a bank by the roadside in Preston's Ravine, California, November 25, 1911, *W. A. Murrill* and *L. R. Abrams 1169*. Related to *G. decoratus*, but not conspicuously decorated, and without cystidia.

4. **Gymnopilus pallidus** sp. nov.

Pileus irregularly convex to plane, umbonate, 3–7 cm. broad; surface dull yellowish-gray, dry, smooth, glabrous, margin inflexed; context hyaline to grayish, watery, without characteristic taste or odor; lamellae adnexed, close, broad, falcate, grayish-white to fulvous; spores broadly ellipsoid, smooth, ochraceous-ferruginous under a microscope, fulvous in mass, 8–9×3.5–$4.5\,\mu$; stipe stout, pallid, hollow, fibrillose, 3–4 cm. long, 5–7 mm. thick; veil slight, evanescent, leaving no annulus.

Type collected on the ground under conifers at New Westminster, British Columbia, March 28, 1905, *Albert I. Hill 6*.

5. **Gymnopilus permollis** sp. nov.

Pileus convex, not umbonate, solitary, wood-loving, 7 cm. broad; surface viscid when young, becoming dry, smooth, glabrous, very soft and pliable to the touch, isabelline; lamellae remotely sinuate-adnate, rather distant, broad, becoming fulvous; spores ovoid, slightly one-sided, obliquely pointed, minutely roughened, melleous under a microscope, with one large nucleus, $11 \times 6\,\mu$; stipe equal, longitudinally striate, white, furfuraceous at the apex, fleshy, 8 cm. long, 8 mm. thick.

Type collected on dead wood in a coniferous forest near Seattle, Washington, October 20–November 1, 1911, *W. A. Murrill 546*.

6. **Gymnopilus subflavidus** sp nov.

Pileus thin, conic or convex to expanded, umbonate when young, cespitose, wood-loving, 3–5 cm. broad; surface slimy, glabrous, smooth, melleous with fulvous center, becoming green-spotted when handled, margin entire, strongly incurved; lamellae citrinous to fulvous, sinuate or adnate, of medium breadth and distance; spores ellipsoid, rounded at the ends, smooth, melleous un-

der a microscope, 7–8 × 3.5–4 μ; stipe equal, cremeous above, pale-fulvous below, smooth, fibrillose, 4–7 cm. long, 5–8 mm. thick; veil slight, citrinous, membranous in young stages, soon breaking into fibrils and leaving no annulus.

Collected on dead stumps and logs in woods near Seattle, Washington, October 20–November 1, 1911, *W. A. Murrill 298 (type), 496.*

7. **Gymnopilus californicus** (Earle)

Flammula californica Earle, Bull. N. Y. Bot. Gard. **2**: 342. 1902.

Described from specimens collected by Baker in grassy places under trees, probably from buried wood, at Stanford University, December 5, 1901.

Stanford University, California, *Baker 167, Miss Patterson 75.*

8. **Gymnopilus Hillii** sp. nov.

Pileus slightly convex, umbonate, cespitose, 2–4 cm. broad; surface smooth, dry, glabrous, raw-sienna, brown to buff at the center; margin thin, even; context very thin, yellowish, mucilaginous to the taste, odor not characteristic; lamellae adnate or emarginate, crowded, inserted, rather broad, falcate, yellowish to fulvous; spores ovoid, smooth, fulvous, 6 × 3.5–4 μ; stipe flexed because of its lateral position on the trunk, equal, glabrous, umber-brown to slightly blackish below, lighter above, hollow, 2.5–4 cm. long, 2–5 mm. thick.

Type collected on rotten logs and stumps at New Westminster, British Columbia, April 23, 1905, *Albert I. Hill 7.*

9. **Gymnopilus fulvellus** (Peck)

Flammula fulvella Peck; Macoun, Fur Seals North Pac. Pt. III. 584. 1899.

Pileus thin, convex or nearly plane, glabrous, subtawny, the margin deflexed or incurved, flesh whitish; lamellae thin, subdistant, adnate or slightly decurrent, somewhat tawny, inclining to ochraceous-tawny; stem equal, solid, fibrillose or fibrillose-squamulose, colored like the pileus; spores ellipsoid, 12.5 × 7.5 μ.

Pileus 1.2–2.4 cm. broad; stem about 2.5 cm. long, 3–4 mm. thick.

Described from dried specimens collected on low ground, St. Paul Island, Bering Sea, September, 1896, by J. M. Macoun.

10. **Gymnopilus penetrans** (Fries)

Flammula penetrans (Fries) Quél. Champ. Jura Vosg. 233. 1872.

Seattle, Washington, *Murrill 250, 361, 383, 411, 433, 455, 481, 486, 635, 693;* Glen Brook, Oregon, *Murrill 746, 767;* Searsville, California, *F. J. Jack 92;* Marin County, California, *Miss Eastwood 39;* Stanford University, California, *Abrams & McMurphy 65.*

11. **Gymnopilus sapineus** (Fries)

Flammula sapinea (Fries) Quél. Champ. Jura Vosg. 98. 1872.

This species differs little from *G. penetrans.* Fries combined the two in his *Systema,* but later separated them again. The points of difference as he states them and also figures them are, as follows: *G. penetrans* is glabrous, with sinuate gills, which become fulvous-spotted, and a long stipe with white base and reddish-brown interior. *G. sapineus* is slightly floccose-squamulose, becoming rimose, with adnate gills, and short stipe not white at the base and yellow within. Cooke's figures of *G. sapineus* seem to agree well with Fries' figures of *G. penetrans.*

Salem, Oregon, *M. E. Peck.*

12. **Gymnopilus spumosus** (Fries)

Flammula spumosa (Fries) Quél. Ench. Fung. 70. 1886.

Seattle, Washington, *Murrill 605.*

13. **Gymnopilus spinulifer** sp. nov.

Pileus convex, umbonate, at length expanding and losing the umbo, scattered or clustered, 3.5–8 cm. broad; surface smooth, glabrous, viscid, light-yellow with bay center, margin entire; context cremeous, without characteristic taste or odor; lamellae adnate or very slightly sinuate, plane, of medium breadth and distance, yellowish to ferruginous; spores ovoid to ellipsoid, smooth, pale-melleous under a microscope, dark-fulvous in mass; cystidia hyaline, flask-shaped, with short, narrow neck and long stalk, $70 \times 15\,\mu$; stipe equal, hollow, subglabrous, with conspicuous mycelium at the base, yellowish-white or tinted with bay; veil arachnoid, whitish, leaving a small ring of fibrils near the apex of the stipe.

Type collected on the ground among leaves under redwoods near Portola, California, January 4, 1903, *James McMurphy 10.* Also collected under redwoods near Jasper Ridge, California, January 11, 1912, *James McMurphy 143.* Both of these collections were accompanied by excellent field notes and sketches. Specimens without notes but recognized by the characteristic cystidia are, as follows: Mill Valley, California, under redwoods, December 28, 1902, *Alice Eastwood 25;* Santa Cruz Mountains, under redwoods, December, 1895, *W. R. Dudley 107, 126.*

14. **Gymnopilus echinulisporus** sp. nov.

Pileus convex to plane, at length depressed, slightly umbonate when young, wood-loving, reaching 7 cm. broad; surface nearly smooth, moist, glabrous, shining, ferruginous at the center, fulvous on the margin, paler in dry weather, when it is usually darker at the center than on the margin; margin folded or fissured, strongly incurved on drying; lamellae sinuate-adnate with a tooth, broad, slightly ventricose, ferruginous-isabelline to fulvous; spores broadly ovoid to subglobose, conspicuously and densely echinulate, ferruginous under a microscope, 6–9 × 5–6 μ; stipe equal, or enlarged just at the base, longitudinally striate, whitish to isabelline-ferruginous, about 6 cm. long, 1.3–1.6 cm. thick; veil apparently wanting, even in quite young plants.

Type collected on dead wood in moist woods at Mill City, Oregon, November 9, 1911, *W. A. Murrill 815.* Also collected on dead wood in woods near Corvallis, Oregon, November 6–11, 1911, *W. A. Murrill 939.*

15. **Gymnopilus vialis** sp. nov.

Pileus convex to expanded, at length depressed, splitting radially at the margin, wood-loving, 5 cm. broad; surface dry, glabrous, smooth, at length rimose, dark flavo-luteous with bay center or the entire surface bay; lamellae adnate, ventricose, broad, rather close, citrinous to ferruginous-fulvous; spores ellipsoid, rounded at the ends, smooth, melleous under a microscope, 7 × 3.5 μ; stipe equal or inflated, solid or hollow, citrinous, fibrillose, especially at the top, where a slight trace of the fugacious veil remains, 5 cm. long, 1–1.5 cm. thick.

Type collected on a railway tie in the town of Corvallis, Oregon, November 6–11, 1911, *W. A. Murrill 969.*

16. **Gymnopilus subcarbonarius** sp. nov.

Pileus convex to expanded, rarely umbonate, rather thin, gregarious, 3–4 cm. broad; surface smooth, glabrous, very viscid, red to bay, yellow on the margin, sometimes darker at the center; lamellae adnate or sinuate, not crowded, rather narrow, inserted, pale-yellow to ochraceous or fulvous; spores ellipsoid, smooth, melleous under a microscope, fulvous in mass, 7×3–$4\,\mu$; stipe short, somewhat enlarged below, white, scaly, hollow, 3–4 cm. long, 4–8 mm. thick; veil fibrillose, evanescent, not leaving an annulus.

Type collected on the ground at Berkeley, California, January 31, 1911, *R. A. Harper 6.* Closely allied to *G. carbonarius,* but differing in the color of the gills.

17. **Gymnopilus carbonarius** (Fries)

Flammula carbonaria (Fries) Quél. Champ. Jura Vosg. 232. 1872.

For a description and colored figure of this species, see MYCOLOGIA for July, 1912. It usually occurs in charred ground and is of a nearly uniform reddish-brown color, with lamellae yellowish-white to dark-ochraceous or pale-fuscous and spores ferruginous, 7×3–$4\,\mu$. *G. spumosus* occurs on naked ground and is yellowish-brown with reddish-brown center, and has yellow to ferruginous lamellae, with ochraceous spores that are slightly larger than those of *G. carbonarius.*

Seattle, Washington, *Murrill 263, 325, 627, 641;* Salem, Oregon, *M. E. Peck;* La Honda, California, *Murrill & Abrams 1259;* Presidio, California, *Harper 69;* Stanford University, California, *Abrams 205, Miss Patterson 19.*

18. **Gymnopilus viscidissimus** sp. nov.

Pileus conic, not fully expanding, gregarious, 2 cm. broad; surface smooth, glabrous, very slimy, isabelline with an incarnate tint, usually a little darker at the center; lamellae sinuate-adnate, broad, ventricose, rather crowded, pale-isabelline, becoming darker with age; spores ovoid, pointed, often one-sided, very pale with a fuscous tint under a microscope, dark-fulvous in mass, 7×3–$4\,\mu$; stipe equal or slightly larger below, stuffed, whitish, furfuraceous above, fibrillose below, rather tough, 6 cm. long, 3.5 mm. thick.

Type collected among mosses and humus on the ground in low woods at Mill City, Oregon, November 9, 1911, *W. A. Murrill 833*. Also collected in a peat bog near Seattle, Washington, October 20–November 1, 1911, *W. A. Murrill 347*.

19. **Gymnopilus latus** sp. nov.

Pileus convex to plane, not umbonate, gregarious, wood-loving, reaching 9 cm. broad; surface glabrous, shining, viscid, radiate-lineate, ferruginous-fulvous at the center, ochroleucous on the margin; context rather thin, mild to the taste; lamellae sinuate or adnate, pallid to fulvous, plane, not crowded, rather narrow; spores ellipsoid, rounded at the ends, smooth, melleous under a microscope, $6 \times 3.5\,\mu$; stipe equal, or slightly larger below, dry, smooth, subglabrous, fleshy, white or somewhat yellowish, with yellow or orange mycelium at the base, 5–7 cm. long, 1–1.3 cm. thick; veil pale-yellow, membranous in young sporophores, soon breaking into fibrils and disappearing.

Type collected on a dead deciduous log in woods near Seattle, Washington, October 20–November 1, 1911, *W. A. Murrill 650*.

20. **Gymnopilus viridans** sp. nov.

Pileus thick, convex, with large umbo, cespitose, wood-loving, reaching 8 cm. broad; surface dry, ochraceous, becoming green-spotted when handled, with conspicuous light-bay scales sparsely scattered except at the center, where they are rather close together; lamellae adnate, broad, crowded, isabelline to ferruginous, edges undulate; spores ellipsoid, obliquely pointed at one end, smooth, ferruginous in mass, $7 \times 3.5\,\mu$; stipe larger below, longitudinally streaked, concolorous, reaching 6 cm. long, and 2 cm. thick.

Type collected on a burnt coniferous log in an open field near Seattle, Washington, October 20–November 1, 1911, *W. A. Murrill 657*. Also collected in clusters by the roadside near woods at Green River, King County, Washington, June, 1891, *A. M. Parker 1*. In habit and appearance, the plant resembles *Lentinus lepideus* and *Pholiota aeruginosa*.

21. **Gymnopilus foedatus** (Peck)

Hebeloma foedatum Peck, Bull. Torrey Club **22**: 202. 1895.

Described from specimens collected by McClatchie on the streets of Pasadena, California. Similar to *G. carbonarius* in appearance, but with much darker spores.

Pasadena, California, *McClatchie;* Claremont, California, *Baker.*

8. PHOLIOTA (Fries) Quél. Champ. Jura Vosg. 91. 1872

1. PHOLIOTA MARGINATA (Batsch) Quél. Champ. Jura Vosg. 94. 1872

Muir Glacier, Alaska, *Trelease 525.* Specimens not seen, but it is doubtful if they represent the plant originally described by Batsch.

2. PHOLIOTA UNICOLOR (Vahl) Gill. Champ. Fr. 1: 436. 1878

This species is very abundant on dead wood in the Pacific Coast region. It differs from the plants usually known as *P. marginata* in having broader gills and larger spores, the latter measuring 8–10 × 5–6 μ.

Seattle, Washington, *Murrill 254, 264, 278, 350, 392, 474, 590, 690, 697;* Mill City, Oregon, *Murrill 820;* Corvallis, Oregon, *Murrill 977, 1017;* Preston's Ravine, California, *Murrill & Abrams 1232, 1237;* La Honda, California, *Murrill & Abrams 1246, 1282, 1305;* Yakutat Bay, Alaska, *Trelease 520.*

3. **Pholiota subnigra** sp. nov.

Pileus very small for the genus, convex, slightly umbonate, solitary, 1.3 cm. broad; surface smooth, glabrous, slightly viscid, uniformly fuliginous, except on the immediate margin, where it is hoary on account of a pubescence originating from the veil; lamellae sinuate-adnate, ventricose, broad, not crowded, becoming fulvous, the edges remaining whitish; spores irregularly ellipsoid, pointed at the base, 1–2-guttulate, smooth, melleous under a microscope, 10–11 × 4–5 μ; stipe equal, cylindric, pallid, fleshy, solid, rough with short, soft, whitish, conic scales pointing upward, 2 cm. long, 2.5 mm. thick; veil ample, white, membranous, leaving a large, superior, persistent annulus.

Type collected on the ground in woods, attached to a small buried root, near Seattle, Washington, October 20–November 1, 1911, *W. A. Murrill 380.*

4. PHOLIOTA CANDICANS (Bull.) Schröt. Krypt. Fl. Schles. 3[1]: 608. 1889

Pholiota praecox (Pers.) Quél. Champ. Jura Vosg. 91. 1872.

A description and colored figure of this common eastern species were published in MYCOLOGIA for July, 1911. I found it only twice on the Coast.

Open grassy ground, Seattle, Washington, *Murrill 337;* mixed woods, Corvallis, *Murrill 1021;* Woodside, California, *E. B. Copeland;* Yakutat Bay, Alaska, *Trelease 502, 514, 517.*

5. PHOLIOTA ANOMALA Peck, Bull. Torrey Club **22**: 202. 1895

Pileus at first hemispheric or subconic, then convex, glabrous, hygrophanous, broccoli-brown when moist, pale-yellow or cream-color when dry; lamellae adnate or slightly decurrent, subarcuate, pale becoming brownish-ferruginous, often white on the edge; stem cavernous or hollow with irregular transverse partitions, sometimes containing a cottony tomentum, whitish, with a slight evanescent annulus; spores ellipsoid, 8–10 × 6–7 μ.

Pileus 1.5–3.5 cm. broad; stem 4 cm. long, 2–6 mm. thick.

Described from specimens collected by McClatchie among sticks and leaves on the ground near Pasadena, California, in January. The species suggests *Tubaria.*

6. **Pholiota washingtonensis** sp. nov.

Pileus convex to applanate or slightly depressed, thin, gregarious, cespitose at times, reaching 10 cm. broad; surface hygrophanous, smooth, glabrous, more or less rugose, pale-isabelline, dull-fulvous at the center, margin striate, rather irregular; lamellae adnate with a tooth, broad, not crowded, avellaneous, becoming dark-fulvous; spores irregularly ellipsoid, often plane on one side, pointed obliquely at the base, smooth, ferruginous under a microscope, with a single large nucleus, 11 × 6 μ; stipe fleshy, streaked, equal or tapering upward, white at the apex, brownish and fibrillose below, 6–8 cm. long, 0.5–1.5 cm. thick; veil ample, white, membranous, leaving a large, superior, persistent annulus.

Collected on the ground in low woods near Seattle, Washington, October 20–November 1, 1911, *W. A. Murrill 333 (type), 563, S. M. Zeller.*

7. **Pholiota McMurphyi** sp. nov.

Pileus convex to subexpanded, rather thick and fleshy, scattering, 4–8 cm. broad; surface slimy-viscid, smooth, glabrous, fulvous at the center, greenish-yellow on the margin; context whitish, without characteristic taste or odor; lamellae adnate, slightly sinuate, broad, plane, close, becoming fulvous with a bay tint; spores ellipsoid, pointed at times, ferruginous under a microscope, rough with tubercles or short papillae, averaging $12 \times 7 \mu$; stipe cylindric, equal, yellowish-white, solid or slightly spongy within, the surface rough with projecting ridges as though furnished with several scanty rings, 4–6 cm. long, 1–2 cm. thick; veil white, fibrillose even when young, leaving an annulus consisting of a few inconspicuous fibrils.

Type collected among leaves under oak trees near Searsville Lake, California, December 28, 1902, *James McMurphy 11.*

8. **Pholiota albivelata** sp. nov.

Pileus thin, convex to plane, slightly umbonate, solitary, terrestrial, reaching 5.5 cm. broad; surface very slimy-viscid, isabelline tinted with rose, resembling the color of some species of *Gomphidius*, the umbo slightly darker; lamellae adnate or slightly sinuate, arcuate, not crowded, becoming fulvous, edges pallid; spores ellipsoid, smooth, melleous under a microscope, 1–2-guttulate, $9–11 \times 4–5 \mu$; stipe milk-white throughout, glabrous and slightly smaller above the annulus, shaggy at the center, fibrillose becoming subglabrous and rarely yellowish at the base, solid, about 8 cm. long, 7 mm. thick above, 10 mm. thick below; annulus above the middle of the stipe, very ample, milk-white, fixed, persistent, colored above by the spores and furrowed by the lamellae.

Type collected on the ground in woods near Seattle, Washington, October 20–November 1, 1911, *W. A. Murrill 593.* Also collected in the same region, *S. M. Zeller 88;* at Glen Brook, Oregon, November 7, 1911, *W. A. Murrill 741;* and at Newport, Oregon, November 13, 1911, *W. A. Murrill 1048.*

9. PHOLIOTA VENTRICOSA Earle, Bull. N. Y. Bot. Gard. **2**: 341. 1902

Pileus very convex, obtuse, cespitose, wood-loving, reaching 8 cm. in diameter; surface moist, ferruginous or luteous to dark-ferruginous or latericious, slightly fibrillose-striate, with frag-

ments of the cream-colored, rather well-developed veil clinging to the margin and forming a small annulus near the apex of the stipe; lamellae sinuate to adnate with decurrent tooth, melleous to ferruginous, of medium breadth and distance, edges very irregularly repand and toothed; spores ellipsoid or ovoid, ferruginous, rough with conspicuous granular or short-papillate protuberances, 8–9 × 4–5 μ; stipe bulbous, hollow, streaked, fibrillose-striate, cream-colored above, ferruginous below, 6–9 × 1–2 cm.

Described from specimens collected at the base of pine trees at Stanford University, California, *Baker 122.* Found on logs of *Pseudotsuga* at Seattle. Closely related to *Gymnopilus.*

Seattle, Washington, *Murrill 575, 618, Zeller 84, 118, A. M. Parker 2;* Glen Brook, Oregon, *Murrill 748;* Searsville Lake, California, *McMurphy 104;* Stanford University, California, *McMurphy 131, Baker 122.*

9. HYPODENDRUM Paulet, Icon. 75. 1793

1. **Hypodendrum flammans** (Batsch)

Agaricus flammans Batsch, Elench. Fung. 87. *f. 30.* 1783.

Pileus convex, fleshy, cespitose, 2–2.5 cm. broad; surface luteous, decorated with a few floccose, flavous scales, which appear to fall away with age; veil large, flavous, floccose-fibrous; lamellae adnate; spores subhyaline, ellipsoid, 4 × 2 μ, not mature; stipe rough with floccose, flavous scales, fistulose, firm, 3 cm. long, 7 mm. thick.

Growing from a knothole near the base of a living trunk of *Abies.* The specimens are, unfortunately, immature.

Glen Brook, Oregon, *Murrill 770.*

2. **Hypodendrum limonellum** (Peck)

Agaricus (*Pholiota*) *limonellus* Peck, Ann. Rep. N. Y. State Mus. **31**: 33. 1879.

Corvallis, Oregon, *Murrill 951.* Growing from a crack in a standing dead trunk of *Crataegus* in woods.

3. **Hypodendrum oregonense** sp. nov.

Pileus convex, at first circular, becoming one-sided from its position, not umbonate, thick and fleshy, cespitose, reaching 5 cm.

or more broad; surface dry, smooth, glabrous, flavous-ochraceous, margin strongly incurved; context thick, cremeous; lamellae adnate, yellowish to yellowish-brown, becoming fulvous, strongly interveined, distant, edges irregular; spores ellipsoid, smooth, ferruginous, uniguttulate, 7–9 × 4–5 μ; stipe dry, large, varying in shape from ventricose to enlarging upward, yellowish above, fulvous below, with small, scattered, unicolorous scales pointing upward; veil large, irregular, yellowish-white, leaving an irregular, superior annulus.

Type collected on a decayed spot in a living willow trunk in a meadow near Glen Brook, Oregon, November 7, 1911, *W. A. Murrill 754*.

10. LOCELLINA Gill. Champ. Fr. **1**: 428. 1878

Locellina stercoraria (Peck)

Pluteus stercorarius Peck, Bull. Torrey Club **22**: 488. 1895.
Locellina californica Earle, Bull. N. Y. Bot. Gard. **3**: 299. 1904.

Stanford University, California, *Baker 382, Abrams 2, Nohara 47, M. T. Cook 9, Miss Patterson 45;* Madera Creek, California, *McMurphy 42;* New Westminster, British Columbia, *A. I. Hill 9*.

NEW COMBINATIONS

For the benefit of those using Saccardo's nomenclature, the following new species in the above article are recombined, as follows:

GYMNOPILUS DECORATUS = **Flammula decorata.**
GYMNOPILUS ECHINULISPORUS = **Flammula echinulispora.**
GYMNOPILUS HILLII = **Flammula Hillii.**
GYMNOPILUS LAETICOLOR = **Flammula laeticolor.**
GYMNOPILUS LATUS = **Flammula lata.**
GYMNOPILUS ORNATULUS = **Flammula ornatula.**
GYMNOPILUS PALLIDUS = **Flammula pallida.**
GYMNOPILUS PERMOLLIS = **Flammula permollis.**
GYMNOPILUS SPINULIFER = **Flammula spinulifer.**
GYMNOPILUS SUBCARBONARIUS = **Flammula subcarbonaria.**
GYMNOPILUS SUBFLAVIDUS = **Flammula subflavida.**
GYMNOPILUS VIALIS = **Flammula vialis.**
GYMNOPILUS VIRIDANS = **Flammula viridans.**
GYMNOPILUS VISCIDISSIMUS = **Flammula viscidissima.**
HYPODENDRUM OREGONENSE = **Pholiota oregonensis.**
VENENARIUS PANTHERINOIDES = **Amanita pantherinoides.**
VENENARIUS PRAEGEMMATUS = **Amanita praegemmata.**
VENENARIUS UMBRINIDISCUS = **Amanita umbrinidisca.**

NEW YORK BOTANICAL GARDEN.

POLYSTICTUS VERSICOLOR AS A WOUND PARASITE OF CATALPA

NEIL E. STEVENS

(WITH PLATES 74 AND 75, CONTAINING 4 FIGURES)

The wood rot of living catalpa caused by *Polystictus versicolor* is the only really serious disease of the catalpa yet reported. *Polystictus versicolor* is, of course, one of the most common wood-rotting saprophytes, but as was pointed out by von Schrenk (8) in 1902, it becomes on the catalpa a dangerous wound parasite, growing with great rapidity in living trees, spreading up and down the trunk from the point of infection, out into the branches and even into the roots (8, p. 53). On living trees the fungus produces sporophores in great abundance, but is rarely found fruiting on dead catalpa; a fact which apparently led von Schrenk to the conclusion that *P. versicolor* is unable to grow on dead catalpa wood and that even when growing in a living tree stops its growth when the tree is cut (8, p. 54). As the writer has shown in a recent paper (7), however, *Polystictus versicolor* may continue to grow on dead catalpa wood and under favorable conditions may produce normal sporophores in considerable quantity.

The report of von Schrenk on the diseases of the hardy catalpa was based largely on observations in two large plantations in Crawford County, Kansas, the Hunnewell and Farlington plantations. In fact, these two plantations, together with the other large plantations in the eastern portion of Kansas, have served as the basis for most of the work done in this country on the artificial cultivation of the hardy catalpa. During the past year (1911–1912) the writer has investigated the wood rots of the catalpa in this region, with special reference to second growth stands. In the course of this work it has become evident that coppice shoots on partly decayed stumps are much less readily infected than are branches of a partly decayed trunk, and that

there is an apparently constant relation between the presence of a decayed area in the trunk and the formation of tyloses in the outer wood. While the data on these points are by no means so complete as to make possible wholly satisfactory explanations of the conditions mentioned, the observations already made seem of sufficient interest to make their publication worth while.

INFECTION OF COPPICE SHOOTS FROM DISEASED STUMPS

When the large plantations referred to above were first cut over, the trees were from twenty to twenty-four years old. At that time many of the stumps were rotten at the center. Undoubtedly they were affected in most cases by *Polystictus versicolor,* for many of the trees on both the Farlington and Hunnewell plantations were seriously decayed by this fungus at the time of cutting, and in certain portions of these plantations many of the stumps are now bearing numerous sporophores of this species.

Yet sprouts from these partly rotted stumps, even from those which bear sporophores, show no external evidences of fungus infection and are as well developed as those from sound stumps. Six-year old sprouts on partly rotted stumps are fully as large as those of the same age on sound stumps and bear as many seed pods. To determine whether these sprouts were actually free from fungus infection or whether the fungus was present and would finally result in the weakening and death of the sprout, the writer spent several days in a study of the second growth at the Hunnewell plantation. Fortunately for this work, eighty acres of six-year old second growth was sprouted only a few weeks before his visit (March, 1912), and the sprouts were still lying where they had been cut.

A careful examination of this eighty-acre tract showed that while only a very few of the shoots from partly decayed stumps showed any external evidence of fungus infection, a large proportion were rotted at the heart. On the other hand, practically none of the shoots from sound stumps showed decayed areas. In one forty-acre tract nearly two hundred stumps were counted which bore sporophores of *Polystictus versicolor* and the sprouts from nearly all of these showed rotten hearts. On fifteen large

decayed stumps which bore six or more good sized sprouts, every sprout showed a considerable decayed area. In the entire eighty acres, however, only three sprouts were found which bore sporophores.

There can be little question that the decayed sprouts were infected from the stump. In the great majority of cases, the sprouts showed no injury through which the fungus might have entered, and the decayed area was always largest at the base of the sprout. Moreover, no such decayed areas were found in sprouts from sound stumps. The decayed area generally occupied the center of the sprout and extended up from the base for some distance, usually less than two feet and very rarely as much as three. Figs. 1 and 2 show two sections through an unusually large sprout from a stump which bore a large number of sporophores. The section shown in fig. 2 was cut about six inches above the stump and that in fig. 1 two feet above the stump. These figures show that the growth of the sprout had been very rapid, much more rapid in this case than in the majority of the sprouts from sound stumps, and that the action of the fungus was limited thus far to a comparatively small portion of the sprout. How rapid the further progress of the fungus may be cannot, of course, be determined at present, but it is certain that this fungus frequently spreads much more than two feet a year in living catalpa trees. (See 8, p. 53.)

Why decay had not progressed further is a most interesting question. There can be no doubt that the fungus both in the stump and in the sprout was alive and in a vigorous condition at the time the trees were examined. Pieces of the rotten wood placed in a moist chamber showed in a few days a dense growth of characteristic mycelium. Moreover, it is entirely probable that the stumps which produced the rotten sprouts were themselves infected before the trees were cut. Many of the stumps certainly were affected when the plantation was cut over and it is difficult to suppose that the fungus died in these stumps and that they or other stumps were infected later. Infection of sound catalpa wood does not easily occur and the stumps in question were most rotten at the center, exactly the condition found in the stumps of badly rotted trees.

It is possible, of course, that the progress of the fungus in these shoots was slower than in older trees. But even if considerable allowance is made for this assumption, it seems more than probable that these shoots did not become infected for some time, probably several years, after they started. That *Polystictus versicolor* is capable of living for that length of time even without much growth cannot be doubted, for Bayliss (1, p. 20) has proved that the mycelium of this fungus can retain its vitality in a dried stick for at least four years. Observations at Soldier, Kansas, indicate clearly that *Polystictus versicolor* is capable of attacking seedlings even younger than these sprouts. Certainly the fungus spreads rapidly enough from the trunk of a tree into its branches; and it readily attacks and fruits on one-year old sprouts around the base of a living tree.

It is not entirely clear, therefore, why these coppice shoots were not attacked and killed much earlier; but it seems possible that this temporary "immunity" may be due to the rapid growth of the sprouts. Both Hartig and Sorauer have cited examples of wound parasites which, although capable of causing the decay of woody portions growing at an ordinary rate, are unable to attack *rapidly* growing parts. Hartig (3) states that in the case of an oak attacked by *Armillaria mellea*, one may readily observe that the parasite has not developed equally, but usually toward one side. According to him, the development is arrested when the fungus comes to a region directly under the influence of a vigorous shoot.

Sorauer (6, p. 192) discusses the parasitism of *Nectria cinnabarina* and states that this fungus is apparently unable to attack sound, rapidly growing tissue of the host. This writer has observed in the case of small trunks of *Acer Negundo* attacked by *Nectria cinnabarina*, that in the spring the progress of the fungus is stopped by the more vigorous growth of the wood. Sorauer further states that in larger trunks where a sound side shoot has developed, the fungus in the main trunk kills the tissue up to the part which is under the influence of the vigorous side shoot and there remains stationary. It seems possible that something like this occurs in the case of diseased catalpa stumps which have given rise to vigorous coppice shoots. That is to say, that the

fungus may be held in check for a time by the rapid growth of the new tissues.

An examination of such stumps as that shown in fig 4, which is typical of a number found on the Hunnewell plantation, lends support to this idea. This photograph was taken from a section through the base of a stump which bore sporophores of *Polystictus versicolor* and which had produced a sprout of average size. It will be noted that the fungus has destroyed practically all of the wood of the original stump but that the second growth is as yet untouched. That the fungus was in a vigorous condition was proved by placing the stumps in a moist chamber, where mycelium developed on the cut surface in a few days.

Unfortunately, no complete data are at hand by which the rate of growth of catalpa coppice may be compared with that of seedlings. For the first few years the growth of coppice shoots greatly exceeds that of seedlings, but whether this accelerated growth is sufficient to check the progress of the fungus cannot, of course, be determined at present. It is apparent, however, from an unpublished report on the catalpa plantation at Farlington, made in 1911 by Mr. Charles A. Scott, Kansas State Forester, that in this plantation, at least, the accelerated growth of the coppice shoot does not last more than three or four years and that the succeeding growth may be even less than that of normal seedlings. A comparison of his data with that given by Hall (2) for the same plantation in 1902 shows that second growth dominant trees nine years old do not exceed in height average seedling trees of the same age. As the data also show that the rate of growth of second growth trees was considerably greater than that of seedlings during the first three of four years, the subsequent growth of the second growth trees must have been enough slower to make up for what they gained in the first few years.

It is by no means certain that there is any relation between the fact that the shoots grow more rapidly for the first few years and that they are apparently for a time immune to the attacks of the fungus, but the probability is at least great enough to make continued observation on this point worth while. At any rate, the length of time for which the accelerated growth of coppice

shoots continues, and the limited extent of the decayed areas in six-year old sprouts harmonize readily with the idea that these shoots were not attacked until the most rapid growth had ceased. This makes the assumption that there was some causal connection between the rapid growth and the temporary immunity seem not improbable.

CORIOLELLUS SEPIUM.—Although no other dangerous fungus parasites of the hardy catalpa have been reported, the writer has found several species growing to some extent both on living and on dead catalpa (7, p. 116). Next to *Polystictus versicolor,* the species which the writer has most frequently found fruiting on catalpa stumps is *Coriolellus Sepium* (Berk.) Murrill (*Trametes Sepium* Berk.). While this fungus was not present in sufficient abundance to be considered at all important from an economic standpoint, it is interesting to note that the relation of the fungus in the stump to the coppice shoot was apparently the same as in the case of *Polystictus versicolor.* That is, the fungus although well developed and in vigorous condition in the stump, does not readily attack the shoot. Fig. 3 shows a section through the base of a stump which bore numerous sporophores of *Coriolellus Sepium* and had given rise to a six-year old coppice shoot of average size. It will be noted that the fungus had destroyed a considerable portion of the stump but had not entered the sprout.

DEVELOPMENT OF TYLOSES NEAR A DECAYED REGION

In sections made for the purpose of studying the effect of the fungus on the wood, an interesting relation between the presence of the fungus and the occurrence of tyloses was noted. This relation was observed in the wood of both seedling trees and coppice shoots; and was so striking and constant that it seems that there must be some causal connection and that the presence of a decayed region in a trunk may have a direct bearing on the development of tyloses.

Tyloses were present to some extent in all pieces of catalpa examined but a marked difference was evident between the number of tyloses present in sound and in infected wood. The difference appears both in the number of tyloses present in each

annual ring, and in the age of the wood when tyloses first appear. In normal catalpa wood tyloses are found almost exclusively in the larger vessels of the spring wood, and even in these they are more or less scattering, many of the vessels containing no tyloses and others being only partly filled. Tyloses first appear in the second ring from the bark, that is, they are found to a very limited extent in two-year old wood. They are more numerous, of course, in wood which is three- or four-years old, but do not occur in sufficient numbers to hinder very seriously the flow of water.

When the outer portion of a trunk which is rotten at the heart is examined, however, tyloses are found filling practically every vessel of the spring wood and occurring to a considerable extent in the vessels of the summer wood. Moreover, there are practically as many tyloses in the two-year old wood as in the five- or six-year old wood. This is the case even when the rotten portion of the trunk is at some little distance from the two-year old wood, often as much as four or five annual rings. Such a condition means, of course, that even the two-year old wood in badly diseased trees is of practically no use for water conduction. It seems probable that the presence of these tyloses and the consequent obstruction to the flow of water would result in the earlier death of the parenchyma cells in these outer annual rings. It seems possible also that these outer rings would then be more readily attacked by the normally saprophytic *Polystictus versicolor,* and that the formation of tyloses may play some part in the invasion of the sap wood by the fungus.

It would, of course, be unsafe to assume without further proof that this markedly increased development of tyloses is due to the fact that part of the trunk is decayed. But Hartig (4, p. 235) observed that "when the wood of a dicotyledonous tree is exposed by a wound the vessels become completely plugged up by tyloses," and there is considerable resemblence between this condition and that found by the writer in partly rotted catalpa trunks. If, as is generally believed (5), the formation of tyloses occurs when the pressure in the vessels becomes less than that of the adjacent parenchyma cells, then anything that reduces the pressure in the vessels while the parenchyma cells are alive

would tend to increase the number of tyloses. Whether the presence of a considerable decayed area would occasion any reduction of the pressure in the vessels and thus result in the great increase in the number of tyloses which occurs, is by no means certain but it seems to offer the only explanation of this interesting condition.

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EXPLANATION OF PLATES LXXIV AND LXXV

Figs. 1 and 2. Sections of a large six-year-old catalpa sprout on a stump which bore sporophores of *Polystictus versicolor*. The section shown in fig. 1 was taken two feet from the stump, and that shown in fig. 2, six inches from the stump. ×¼.

Fig. 3. Section of the base of a small catalpa stump which bore sporophores of *Coriolellus Sepium* and had produced a normal coppice shoot. ×¾.

Fig. 4. Section of the base of a catalpa stump which bore sporophores of *Polystictus versicolor* and had produced a normal six-year-old coppice shoot. ×½.

POLYSTICTUS VERSICOLOR ON CATALPA

POLYSTICTUS VERSICOLOR ON CATALPA

TYPE STUDIES IN THE HYDNACEAE[1]— I. THE GENUS MANINA

HOWARD J. BANKER

The segregation of fungal forms proposed under the generic name *Manina* was first established with practically its present conception and limitations by Scopoli in 1772 in a work entitled "Dissertationes ad scientiam naturalem pertinentes." This work was a small treatise covering, as its title implies, a wide range of subjects and was in fact only part of a still wider ranging series of papers. The greater part of the work is devoted to subjects in mineralogy, but it also contains a short paper entitled "Plantae subterraneae descriptae et delineatae." This latter paper is often cited by the older mycologists but always simply as "Plantae subterraneae," which as we see is part of a subtitle, and the incomplete citation has made it difficult to locate the original paper. The work in which it appears is rare and a copy was found only in the library of the British Museum. Although the work is obscure and somewhat inaccessible at present, it appears to have been well known to the older mycologists and is of special interest to us because of its containing one of the earliest truly natural segregations out of that assemblage of plants known today as the Hydnaceae.

The name *Manina*, diminutive from the Italian *Mano*, a hand, was first proposed by Adanson in the "Familles des Plantes" 2: 5. 1763. Adanson published the name citing in connection therewith "coralloides Micheli *Pl. 88. f. 2 and 6.*"

Micheli's genus as shown both by his description and figures was undoubtedly the branched forms of our more modern genus *Clavaria*. Adanson's genus, therefore, if it were to be recognized, would properly belong to the family of the Clavariaceae, but the genus was not established according to the code here followed.

Scopoli took up Adanson's name and republished it in his

[1] Investigation prosecuted with the aid of a grant from the Esther Herrman Research Fund of the New York Academy of Science.

"Dissertationes ad scientiam Naturalem pertinentes" 97. 1772, where he used it as the name of a new genus and formed several binomial combinations, thus establishing the genus according to our present rules. The first species in this new genus was named by Scopoli *Manina cordiformis* which, therefore, becomes its type. Both the description and the illustration of this species show it to be clearly and unquestionably the species which has long been familiar to mycologists as *Hydnum Erinaceus* Bull. The species associated with this in the genus *Manina* by Scopoli are also the same type of forms as we have usually associated with *H. Erinaceus* and which have been likewise segregated by later mycologists under various names. The genus *Manina* Scop. is, therefore, both technically and logically the genus to which should be referred *Hydnum Erinaceus* Bull. = *Manina cordiformis* Scop. and its natural congeners *Hydnum coralloides* Scop., *H. Caput-ursi* Fr., etc.

In a previous paper[2] the writer referred this group of species to the genus *Hericium* Persoon, "Neues Mag. für die Bot." **1**: 109. 1794. The latter was based on the single species *Hydnum coralloides* Scop. and now becomes a metonym of *Manina* Scop. It was strongly suspected at the time that the latter name had priority but it was impossible then to confirm the fact. As later treated by Persoon, *Hericium* was congeneric with *Manina*.[3]

The genus *Medusina* Chevallier, "Fl. Gen. des Env. de Paris." 278. 1826, was based on *M. patula* Chev. = *Manina cordiformis* Scop. and is, therefore, a typonym of *Manina*. Chevallier's genus was also evidently strictly congeneric with Scopoli's. The genus *Friesites* Karsten, "Medd. Soc. Faun. et Fl. Fenn." **5**: 41. 1879, and the genus *Dryodon* Quélet; Karsten, "Rev. Myc." **3**[1]: 19. 1881, were both established on *Hydnum coralloides* Scop. They are, therefore, typonyms of *Hericium* Pers. and hence metonyms of *Manina* Scop., with which they are apparently also congeneric.

In this connection it is necessary to discuss the proposed names and the status of another so-called genus although it might

[2] Mem. Torrey Bot. Club **12**: 112. 1906.

[3] Cf. Persoon, Comment. de Fung. Clavaef. in Holmskiold Coryph. Clav. 155. 1797.

be ignored on technical grounds. In the same work cited above, Adanson published the genus *Martela* based on "*Agaricum* Micheli *pl. 64. f. 1 and 2;* Battara, *pl. 33. f. C;* Corallo fungus Vaillant Botanicon *pl. 8. f. 1.*" This genus, like his *Manina,* was not established according to modern rules. It is, however, important to note that from the citations it included a somewhat heterogeneous collection of forms. The citations from Battarra and Vaillant indicate branched forms of *Clavaria* similar to Adanson's *Manina.* The citation from Micheli is of more interest. The second figure is clearly a form belonging in *Manina* Scop. and is quite typical of the genus. Figure 1 is the form since known as *Hydnum hystricinum* Batsch = *Hydnum Hystrix* (Pers.) Fr. So far as *Martella* Adans. has any type this species must be considered its type. The species both of Batsch and of Fries appears to have been based on Micheli's figure and it appears very doubtful if the form represents a good species. The figure shows a short cylindric stipe terminating above in numerous straight, diverging, erect teeth.

In 1770, Scopoli took up Adanson's name in "Anni historico-naturales" 4: 151 and established it as a genus under the form *Martella*[4] by publishing it with the species *Martella Echinus* Scop. as the type. This latter species differed from Micheli's plant only in being yellow in color and having the teeth or spines fistulose. It is evident, therefore, that *Martella* as conceived both by Adanson and Scopoli stood for forms in which the teeth or spines stood erect, pointing upward and were not pendent as in the case of *Manina* Scop. *Martella* Scop., therefore, is strictly congeneric with *Hericium* Fries as treated in Fries, "Hymenomycetes Europeae" 617.

We must now turn aside to consider the status of the genus *Hericium* Fries. This genus was published by Fries in his "Systema Orbis Vegetabilis," p. 88, in 1825 and he there definitely stated that it was not to be confused with *Hericium* Pers., the type of which he asserted was *Hydnum coralloides.* It seems probable that Fries' conception of *Hericium* Pers. was that of *Manina* Scop. What was his conception of his own *Hericium?*

[4] This appears to be the correct form, as the word is doubtless from the Italian *Martello,* a scourge.

In the work cited he did not publish any species with his genus nor did he form any binomials, but he cited "Hydna Gomphi" from a previous work, "Syst. Myc." 1: 409. 1821. In this latter work the genus *Hydnum* is divided into sections, one of which is designated "Hydna Gomphi" and consists of four species in the following order: *Hydnum Caput-medusae* (Bull.) Pers.; *H. Hystrix* (Pers.) Fr.; *H. Echinus* (Scop.) Fr. and *H. ramarium* Fr. These four species, therefore, constitute the *Hericium* of Fries as published in 1825. It must be noted that according to our code the type of the genus is *Hydnum Caput-medusae*. This species, however, is of somewhat uncertain standing. If a good species, as generally understood, it belongs to the genus *Manina* Scop., and in that case *Hericium* Fr. becomes a metonym of *Manina* Scop. and also of *Hericium* Pers. Yet Fries expressly and emphatically asserts that his genus is distinct from *Hericium* Pers. If now we consider the remaining species of Fries' genus, it appears evident that his own conception of *Hericium* Fr. is that of *Martella* Scop. This is also confirmed by his later treatment of his genus and by his incidental comments. In the "Hymenomycetes Europeae," p. 617, he published his genus *Hericium* with four species which included only two of the original list. These four species were *Hericium Notarisii* (Inz.) Fr.; *H. Echinus* (Scop.) Pers.; *H. Hystrix* (Pers.) Fr.; and *H. alpestre* Pers. and Fries points out that *Hericium* differs from *Hydnum* in that the teeth are not pendent but are erect, pointing upward. In this work *Hydnum Caput-medusae* and *H. ramarium* have been retained in the genus *Hydnum* and are associated with *Hydnum coralloides* Scop. in the tribe *Merisma*, the type of *Hericium* Pers., which Fries expressly stated was not the same as his own *Hericium*. It appears, therefore, that technically *Hericium* Fries is a metonym of *Manina* Scop. The name of course is untenable, being superceded by *Hericium* Pers. As treated in "Hymenomycetes Europeae," *Hericium* Fr. is a synonym of *Martella* Scop.

The species and the genus appear, however, more or less doubtful. *Hydnum hystricinum* Batsch and all its synonyms appear to have been based on Micheli's figure (Nov. Pl. Gen. *pl. 64. f. 1*), and outside of that figure seems to be wholly unknown. *Martella*

Echinus Scop. is evidently known only from Scopoli's original description, "Anni historico-naturales" **4**: 151. 1770.[5] The work is little known and we have not seen a copy. So far as later descriptions give one a conception of the plant, it appears that it might be some form of a branching *Clavaria*. *Hydnum Notarisii* Inz. and *H. alpestre* Pers. are the only species of the genus of which authentic specimens are in existence. The specimen of *H. Notarisii* Inz. on which Fries based his description and comments is now preserved in the herbarium at Upsala. It has every appearance of being a form of *Hydnum Erinaceus* Bull. with an unusually long stipe. There appears to be nothing whatever about the specimen to suggest but that it grew with the teeth pendent. The statement "Ob clavam oblique deflexam aculei horizontaliter porrecti" appears to be based on accidental inversion of the plant. Inzenga's type has not been seen unless the Friesian specimen is a part of it. In the herbarium of Persoon at Leyden was found a small piece of a specimen marked "*Hericium alpestre* (Helvetia)." This had every appearance of being a fragment of *H. coralloides* Scop. and we do not believe the Persoonian species is distinct from the latter, at least, it is certainly of the same genus.

From our present knowledge of these forms the most that can be said is that *Martella* Scop. (=*Hericium* Fr. "Hym. Eur." 617) is a genus of very doubtful standing. The genus *Manina* Scop., however, is a well-defined genus that has long been recognized by mycologists under various names.

MANINA Scop. Diss. Sci. Nat. **1**: 97. 1772. Type *Manina cordiformis* Scop.

Hericium Pers. Neues Mag. für die Bot. **1**: 109. 1794. Type, *Hydnum coralloides* Scop.

Hericium Fries, Syst. Orb. Veg. 88. 1825, pro parte. Type, *Hydnum Caput-medusae* (Bull.) Pers.

Medusina Chev. Fl. Gen. des Env. de Paris 278. 1826. Type *Medusina patula* Chev.

[5] Cited from Persoon, Comment. de Fung. Clavaef. 160. Scopoli's work has not been seen. Pritzel gives the number of pages in "Anni historico-naturales" 4 as 150.

Friesites Karst. Medd. Soc. Faun. et Fl. Fenn. **5**: 41. 1879. Type, *Hydnum coralloides* Scop.

Dryodon Quél.; Karst. Rev. Myc. **3**[1]: 19. 1881. Type, *Hydnum coralloides* Scop.

1. MANINA FLAGELLUM Scop. Diss. Sci. Nat. 97. *pl. 11.* 1772

Hydnum laciniatum Leers, Fl. Herb. 276. 1775.

Hydnum ramosum Bull. Hist. de Champ. de la France, 305. *pl. 390.* 1791.

Hydnum abietinum Schrad. Spic. Fl. Germ. 181. 1794.

Medusina coralloides Chev. Fl. Gen. des Env. de Paris, **1**: 279. 1826.

The type specimen of none of the above named species is known to be in existence. The synonymy has, therefore, been determined by a comparison of the original descriptions and figures. Scopoli's figure well represents a form which we have heretofore referred to *H. laciniatum* Leers, but the form is not what we consider as typical of Leers's species, as the branches are too long and slender, yet it does not appear to be specifically distinct.

2. **Manina coralloides** (Scop.)

Hydnum coralloides Scop. Fl. Carn. **2**: 472. 1772.

None of Scopoli's types are in existence so far as known. The species described by him as *H. coralloides* has been long well known and frequently described and figured under his name by other authors, but has been more or less confused with forms which we regard as belonging to the segregation that should be referred to *Manina flagellum* Scop. Scopoli did not include this species in his earlier work, in which he established the genus *Manina,* and in none of his later works did he retain his genus, going back instead to the older genus *Hydnum.* Curiously, therefore, the above combination is now made for the first time nearly one hundred and fifty years after the genus and the species had been described by their common author.

3. **Manina Caput-ursi** (Fries)

Hydnum Caput-ursi Fries, Monog. Hym. Suec. **2**: 278. 1863.

No specimen whatever under the above name was found in the herbarium of Fries at Upsala, nor does the species appear to be well represented in any of the European herbaria. So far as can be judged from such poor fragmentary material as the herbaria furnish no well-defined distinction exists between *Hydnum Caput-ursi* Fr. and *H. Caput-medusae* (Bull.) Pers.

4. MANINA CORDIFORMIS Scop. Diss. Sci. Nat. 97. *pl. 10.* 1772.

Hydnum Erinaceus Bull. Hist. de Champ. de la France, 304. *pl. 34.* 1791.

Hericium grandis Raf. Prec. des Decouv. Somiol. 50. 1814.

Steccherinum quercinum S. F. Gray, Nat. Arr. Brit. Pl. **1**: 651. 1821.

Medusina patula Chev. Fl. Gen. des Env. de Paris, **1**: 279. 1826.

Type specimens of none of the forms described under the above names are known to exist. The species, however, is a striking and well-known form that often attracts attention, and there seems to be no reason to question the correctness of the synonymy. The species has generally been known under the name of Bulliard. Scopoli's figure *loc. cit.* shows most clearly that his *M. cordiformis* is the typical form that is everywhere referred to *H. Erinaceus* Bull. The law of priority, therefore, demands that his names should prevail and we have restored it to the species.

5. **Manina Schiedermayeri** (Heufl.)

Hydnum Schiedermayeri Heufler, Osterr. Bot. Zeitschrift **20**: 33. 1870.

The type specimen of this species has not been seen and our conception of the characters is based upon American plants which we have referred here from comparison with the published descriptions and figures. To judge from these American forms, the species departs widely from the generic type and would appear to belong to the resupinate-effused type of structure. Fries, however, regarded the species as of this alliance and the conspicuous

tubercles with pendent teeth, together with the spore characters, suggest at least a close affiliation with the genus *Manina*. We have previously referred this species to "*Hydnum croceum* Schw." On a recent re-examination of Schweinitz's herbarium we have had the good fortune to discover his specimens under this name and it appears very evident that they are not distinct from his *Phlebia hydnoides*. We have, therefore, restored the name of Heufler to this species.

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ASPERGILLUS INFECTING MALACOSOMA AT HIGH TEMPERATURES

WILSON P. GEE AND A. BALLARD MASSEY

In some experiments on the relation of temperature to the life-cycle of the apple tent-caterpillar (*Malacosoma americana* Fabr.), a serious difficulty presented itself in the mortality among the specimens at the higher temperatures due to the infection of the caterpillars with the fungus *Aspergillus flavescens* Eidam. With regard to the injurious nature of the fungi of the genus *Aspergillus*, DeBary[1] has the following to say: "A number of species of *Aspergillus*, all of which occur chiefly as saprophytes and in that mode of life reach their full development, in some cases even forming sporocarps, are able to migrate to the bodies of warm-blooded animals and live at their expense. Their vegetation causes or promotes a diseased state of the parts known to physicians as *mycosis*. *A. flavus*, *A. niger*, and *A. fumigatus*, *Eurodium repens*, and *Aspergillus glaucus* are characteristic promoters of the disease of the human ear which bears the name of *Otomycosis aspergillina*." In regard to the specific fungus with which we are dealing, he states that "Gaffky and others, Lichtheim especially, obtained characteristic phenomena of development, in this case phenomena of disease, when the gonidia of *Aspergillus fumigatus* and *A. flavescens* Eidam, two species distinguished by the high optimum of their vegetative temperature, over 37° C., were introduced by injection into the blood of animals, such as rabbits and dogs."

In the above mentioned experiments, the larvae were subjected continuously to a temperature of 35°–37° C., and were thus at the optimum developmental condition of *A. flavescens*. Although careful search was made in several nests of *Malacosoma americana*, only two specimens which showed any infection whatever from this fungus were secured, among many hundreds, and

[1] Comp. Morph. and Biology of the Fungi, Mycetozoa and Bacteria, 369, 370. 1887.

these were in a nest which had been previously sprayed with a suspension of spores in sterile water. Thus the fungus cannot be classed as of economic importance since it is only at the higher temperatures that it does its damage.

These conditions suggested a series of experiments to try out the possibility of artificial infection at the normal and higher temperatures.

Six larvae from a perfectly normal nest together with a sufficient number of wild cherry leaves for food, were put into each of four sterile bottles, two of which were sprayed with a spore suspension and the other two kept as a check. The bottles were

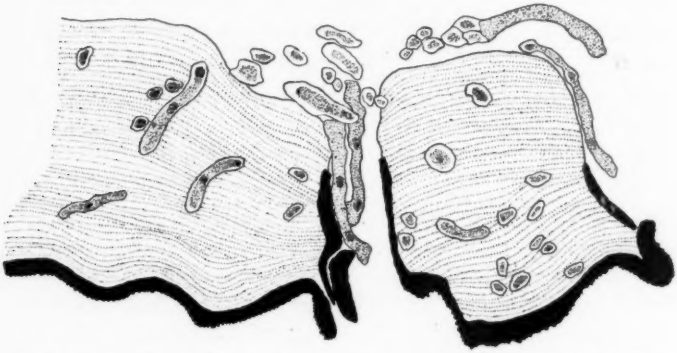

FIG. 1. Section through the cuticle of *Malacosoma americana* Fabr. showing the penetration of *Aspergillus flavescens* Eidam to the exterior through the region of a dermal pore, and the presence of the fungus in the inner layer of the chitin. × 400.

plugged with sterile cotton and placed in the same compartment of an incubator maintained at a temperature of about 37° C. A similar experiment was conducted at the normal outdoor temperature (21°–27° C.). At the end of three days all of the larvae in the sprayed bottle kept in the incubator were dead from infection with *Aspergillus flavescens*. The control specimens, at the incubator temperature, showed no signs of such infection. In the case of the experiment conducted at outdoor temperature, none of the larvae, either sprayed or unsprayed, showed any signs of such infection. A second series of these experiments was carried on with the same results as the first.

Daily observation of the larvae infected showed that the fungus first appeared at the posterior fourth of the body, and from this region progressed anteriorly. This seemed to indicate that infection takes place from the germination of spores taken into the digestive tract of the caterpillar along with its food. Favorable conditions for germination were found in the region of the hind intestine of the insect and the mycelia produced found their way through the intestinal wall into the body cavity and penetrated the chitinous covering in the region of the dermal pores to the exterior of the body. Sections of the larva substantiated this conclusion, and an examination of the accompanying figure will show the presence of mycelia and spores in the inner layer of the chitin covering the body cavity.

The entire body cavity was found to be filled with mycelia and multitudes of spores, accompanied by an almost complete disintegration of cellular structures. This cytolytic action, coupled with interference with the respiratory processes of the insect, affords sufficient cause for its death.

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TWO NEW SPECIES OF RUSTS

WILLIAM H. LONG

On a collecting trip at Takoma Park, Maryland, with Dr. G. G. Hedgcock, a caeoma-like species of *Peridermium* was collected on *Pinus rigida* Mill. which proved to be *Peridermium delicatulum* Arth. & Kern. Later, in looking over the species of *Peridermium* in the Pathological Collections of the United States Department of Agriculture, hoping to find other collections of this rare species, the writer found a specimen on *Pinus virginiana* Mill., which from its gross characters appeared to be *Peridermium delicatulum*, but a microscopic examination showed it to be an undescribed species.

On a trip made during 1911 through some of the forests of Arizona and new Mexico, the writer while descending the Santa Catalina Mountains found, on *Coursetia glandulosa* Gray, a rust which on microscopic examination proved to be an undescribed species intermediate in its generic position between *Phragmopyxis* Dietel and *Calliospora* Arth. Technical descriptions of these two fungi are given below.

Tricella gen. nov.

Cycle of development includes only pycnia and telia, the former subcuticular, the latter subepidermal. Pycnia conoidal, ostiolar filaments usually present; telia erumpent, without paraphyses; teliospores free, three-celled by transverse septa; walls laminate, the inner layer firm, colored, the outer layer gelatinous, translucent, overlaid by cuticle, the pores 3 or 4 in each cell and lateral, pedicel bulbous in the middle.

This genus is intermediate in its characters between *Phragmopyxis* and *Calliospora*, having the three-celled teliospores of the former, and the same cycle of development as the latter.

Tricella acuminata sp. nov.

O. Pycnia epiphyllous in groups intermixed with the telia, smooth, pale-brown, subcuticular, 70–75 μ wide by 50–70 μ high; ostiolar filaments hyaline, 25–35 μ long.

III. Telia amphigenous but mainly epiphyllous, those on lower surface usually opposite corresponding telia on upper surface, more or less circular to ellipsoid, often confluent, 0.5 to 4 mm. in diameter, blackish-brown, pulverulent, ruptured epidermis rather inconspicuous; teliospores ellipsoid to ellipsoid-ovoid, acuminate, rounded at base, 25–40 × 50–75 μ, not constricted at septa; walls laminate, the inner layer firm, dark-brown, 3–4 μ thick, the pores 3 or 4 in each cell, lateral and opposite, the outer layer gelatinous, pale amber-colored at apex, remainder of layer colorless, 4–7 μ thick, sparsely and evenly verrucose; pedicel 50–100 μ long, 10–12 μ thick near spore, colorless, except part at base which is amber-colored for about 10 μ where it broadens out into an ovoid to ellipsoid, hyaline, solid bulb 20–30 μ wide by 25–40 μ long, then contracts into normal size and shape, pedicel down to and including bulb solid or nearly so, below bulb hollow but with thick walls, outer layers of bulb rapidly swelling in water and bursting. Spores often deciduous just below bulb even before being wet; portion of pedicel below bulb not gelatinous nor swelling in water.

On FABACEAE. Type collected on *Coursetia glandulosa* Gray in Sabina Canyon, 5000–7000 feet elevation, Santa Catalina Mountains, Arizona, October 15, 1911, by Long & Hedgcock. It was first found at an elevation of about 7000 feet and was fairly common on this host along the south trail down to the foot of the mountain in the canyon. The writer is indebted to Prof. J. J. Thornber for the identification of the host.

Peridermium inconspicuum sp. nov.

O. Pycnia chiefly hypophyllous, sparse in material at hand, low, conoidal, subcorticular, dehiscent by a longitudinal slit, 0.2–0.3 mm. broad, 0.3–0.7 mm. long, 85–120 μ high.

I. Aecia from a limited mycelium, amphigenous, one to several on slightly discolored spots occupying part of leaf, erumpent from a narrow slit, flattened laterally, 0.3–0.7 mm. long by 0.3–0.9 mm. high, rupturing irregularly, peridium colorless, very fragile, cells overlapping, oblong-lanceolate to oblong, 19–26 μ wide by 32–55 μ long, average size for ten cells 20 × 37 μ, outer wall about 3 μ thick, minutely verrucose, inner wall 5–8 μ thick, closely verrucose, with rather prominent papillae. Aeciospores ellipsoid to spheroid 16–18 × 22–30 μ, average size for ten spores 16.7 × 25 μ, walls colorless, thin, 1–2 μ, minutely verrucose, warts often in irregular groups with clear areas between.

On PINACEAE. Type collected on *Pinus virginiana* Mill. at Glen Echo, Maryland, May 5, 1907, by Miss V. K. Charles. Also collected in same locality on same host June 16, 1912. This species is intermediate in its characters between *Peridermium delicatulum* Arth. & Kern and *Peridermium montanum* Arth. & Kern, but differs from the former in its more prominent aecia and in its overlapping and oblong-lanceolate peridial cells and from the latter in the size of the peridial cells and in the shape and size of the aeciospores.

The peridia of this species are very fragile, so much so that the herbarium specimens collected in 1907 have entirely lost their peridia, and in the field they soon fall away, making the aecia inconspicuous. In this condition they much resemble *Peridermium delicatulum* but a microscopic examination readily shows that the peridial cells distinctly overlap and are not isodiametric but are much longer than broad. This seems to be the first foliicolous species of *Peridermium* reported for this host. The type material was collected from a tree about four feet tall, and was fairly abundant on this one plant. This season (1912) a careful search was made over the same locality from which the type was collected, but only five affected needles were found, and then only one or two to a tree.

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INDEX TO AMERICAN MYCOLOGICAL LITERATURE

This index is prepared by Dr. B. O. Dodge, of Columbia University, and covers the same scope for the fungi as that covered by the general index published monthly in the Bulletin of the Torrey Botanical Club. It is not reprinted on cards for distribution.

Broadhurst, J. A biometrical study of milk streptococci. Jour. Infect. Dis. **10**: 272–284. My 1912.

Brown, P. E. Some bacteriological effects of liming. Centralb. Bakt. Zweite Abt. **34**: 148–172. 15 My 1912.

Chivers, A. H. Preliminary diagnoses of new species of *Chaetomium*. Proc. Am. Acad. Sci. **48**: 83–88. Jl 1912.

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Claassen, E. Alphabetical list of lichens collected in several counties of northern Ohio. Ohio Nat. **12**: 543–548. 7 Je 1912.

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Dodge, B. O. Artificial cultures of *Ascobolus* and *Aleuria*. Mycologia **4**: 218–222. *pl. 72, 73*. 13 Jl 1912.

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Dutton, D. L. Lichen flora of Vermont. Bull. Vermont Bot. Club **7**: 23–25. My 1912.

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Fraser, W. P. Cultures of heteroecious rusts. Mycologia **4**: 175–193. 13 Jl 1912.

The following life histories are worked out for the first time: *Necium Farlowii* Arth., *Pucciniastrum minimum* (Schw.) Arth., *Melampsoropsis Pyrolae* (DC.) Arth., *Uromyces Spartinae* Farl., *Melampsora arctica* Rostr., and *M.* (*Medusae* Thum.?).

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Harter, L. L., & Field, E. *Diaporthe,* the ascogenous form of sweet potato dry rot. Phytopathology **2**: 121–124. *f. 1–4.* Je 1912.

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Hewitt, J. L. Rice blight. Arkansas Agr. Exp. Sta. Bull. **110**: 447–459. 1912.

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Howard, B. J. Decomposition and its microscopical detection in some food products. Yearbook Dept. Agr. **1911**: 297–308. *pl. 15–19.* 1912.

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Massee, G. Fungi exotici: XIII. Kew Bull. Misc. Inf. **1912**: 189–191. My 1912.

Includes *Eutypa gigaspora* Massee from Trinidad.

McMurran, S. M. A new internal *Sterigmatocystis* rot of pomegranates. Phytopathology **2**: 125, 126. Je 1912.

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Orton, C. R. Correlation between certain species of *Puccinia* and *Uromyces.* Mycologia **4**: 194–204. *pl. 70, 71.* 13 Jl 1912.

Includes *Puccinia uniporula* sp. nov.

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Includes notes on injuries to the trees by *Pyropolyporus texanus, Gymnosporangium gracilens,* and *G. nelsoni.*

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